IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

April 22, 2016
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL REPORT

December 10, 2018

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ACRONYM	DESCRIPTIONS
AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
PST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration

nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service
PDT	Pacific Daylight Time
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On April 14, 2016, State and Local Ambient Air Monitoring Stations (SLAMS), located in Brawley (AQS Site Code 060250007) and Westmorland (AQS Site Code 060254003), California measured exceedances of the National Ambient Air Quality Standard (NAAQS). The Federal Equivalent Method (FEM), Beta Attenuation Monitor Model 1020 (BAM 1020) measured (midnight to midnight) 24-hr average Particulate Matter less than 10 microns (PM_{10}) concentrations of 242 µg/m^3 and 192 µg/m^3 (**Table 1-1**). PM_{10} 24-hr measurements above 150 µg/m^3 are exceedances of the NAAQS. The SLAMS in Brawley and Westmorland were the only stations in Imperial County to measure exceedances of the PM_{10} NAAQS on April 22, 2016.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON APRIL 22, 2016

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
4/22/2016	**Westmorland**	**06-025-4003**	**3**	**23**	**192**	**150**
4/22/2016	**Brawley**	**06-025-0007**	**3**	**24**	**242**	**150**
4/22/2016	Calexico	06-025-0005	3	24	87	150
4/22/2016	El Centro	06-025-1003	4	24	86	150
4/22/2016	Niland	06-025-4004	3	24	115	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from Federal Reference Method (FRM) Size-Selective Inlet (SSI) instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM_{10} data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM_{10} data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM_{10} data since 2013 is regulatory. On April 22, 2016, elevated particulate matter affected the Brawley and Westmorland monitors when entrained fugitive windblown dust from high winds associated with a large and deep upper level trough with an accompanying strengthening of surface gradients moved over the region and into Imperial County.

This report demonstrates that a naturally occurring event caused an exceedance observed on April 22, 2016, which elevated particulate matter and affected air quality. The report provides concentration to concentration monitoring site analyses supporting a clear causal relationship

[1] According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term "standard time" or "daylight time". For year-round use the designation can be left off inferring "local time" daylight or standard whichever is present. For 2016, Pacific Daylight Time (PDT) is March 13 through November 6. https://www.nist.gov/pml/time-and-frequency-division/local-time-faqs#intl

between the event and the monitored exceedances and provides an analysis supporting the not reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides information that the exceedances would not have occurred without the entrainment of fugitive windblown dust from outlying deserts and mountains within the Sonoran Desert. The report further substantiates the request by the ICAPCD to exclude PM_{10} 24-hour NAAQS exceedances of 242 µg/m^3 and 192 µg/m^3 (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)[2].

I.1 Demonstration Contents

Section II - Describes the April 22, 2016 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the wind driven emissions from the event led to the exceedance at the Brawley and Westmorland monitors.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Brawley and Westmorland stations this section discusses and establishes how the April 22, 2016 event affected air quality such that a clear causal relationship is demonstrated between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM_{10} data measured in both local conditions and standard conditions. Measured PM_{10} continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the April 22, 2016 event and its resulting emissions defining the event as a "natural event".[3]

Section IV - Provides evidence that the event of April 22, 2016 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

I.2 Requirement of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

[2] "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

[3] Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD provided the National Weather Service (NWS) weather discussion via the ICAPCD's webpage for April 20, 2016 through April 22, 2016. The ICAPCD notification included forecast information for Friday April 22, 2016 indicating that significant and widespread cooling along with gusty west winds in the mountains and deserts would follow a series of Pacific low-pressure systems. The San Diego and Phoenix NWS weather stories and the ICAPCD web notification advised of the possibility of strong and gusty winds through the mountains and desert regions through the day, with the potential for elevated particulate matter due to blowing dust. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day advisory for Imperial County on April 22, 2016. **Appendix A** contains copies of notices pertinent to the April 22, 2016 event.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. Notification occurs when an agency submits a request, which includes an initial event description, for flagging data in AQS.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an "Initial Notification of Potential Exceptional Event" (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM_{10} concentrations from the Brawley and Westmorland monitors on April 17, 2017. The INPEE, for the April 22, 2016 event, was formally submitted by the CARB to USEPA Region 9 on April 24, 2017. Subsequently there after a second revised request was sent to CARB requesting preliminary flags on additional days for 2016. **Table 1-1** above provides the PM_{10} measured concentrations for all monitors in Imperial County on April 22, 2016. The submitted request included a brief description of the meteorological conditions for April 22, 2016 indicating that a potential natural event occurred.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on January 10, 2018. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the measured concentrations of 192 µg/m^3 and 242 µg/m^3, which occurred on April 22, 2016 in Brawley and Westmorland. The final closing date for comments was February 12, 2018. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County are set to discuss each flagged exceedance for 2016.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the April 22, 2016 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM_{10} State Implementation Plan for Imperial County in 2018.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

A This demonstration provides evidence that the event, as it occurred on April 22, 2016, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

- a The event created the meteorological conditions that entrained emissions and caused the exceedance.
- b The event clearly "affects air quality" such that there is the existence of a clear causal relationship between the event and the exceedance.
- c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
- d The event "is not reasonably controllable and not reasonably preventable."
- e The event is "caused by human activity that is unlikely to recur at a particular location or [is] a natural event."
- f The event is a "natural event" where human activity played little or no direct causal role.

B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Brawley and Westmorland.

C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II April 22, 2016 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the April 22, 2016 event unfolded in Imperial County. The subsection elements include

- » A description and map of the geographic setting of the air quality and meteorological monitors
- » A description of Imperial County's climate
- » An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (**Figure 2-1)**.The Colorado Desert not only in includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994)

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6)**. Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter) mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back county with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK

Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS

Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Gorgonio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that impact Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT

Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

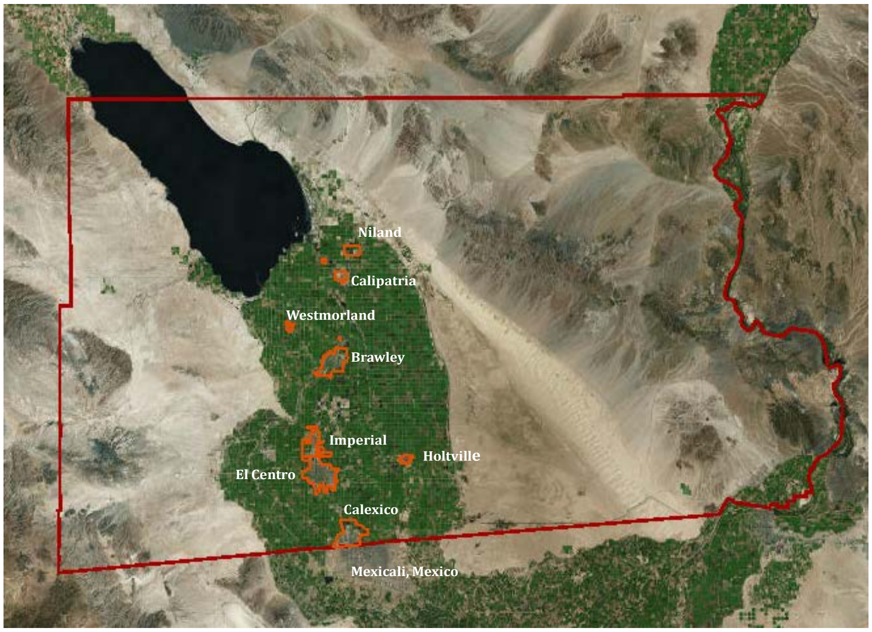


Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, and the City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south.

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

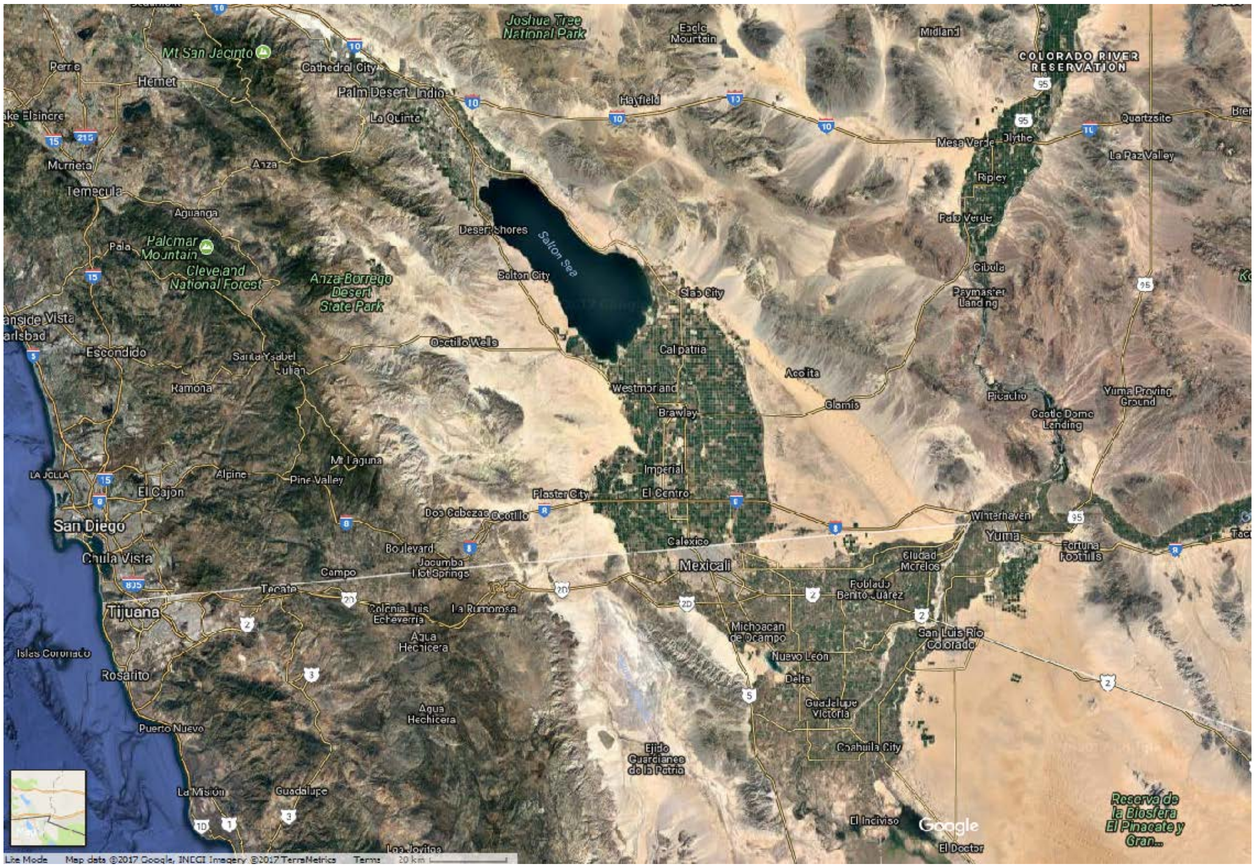


Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8)**.

As mentioned above, the PM_{10} exceedances on April 22, 2016, occurred at the Brawley and Westmorland stations. The Brawley and Westmorland stations are regarded as the "northern" monitoring sites within the Imperial County air monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on April 22, 2016, other meteorological sites were used in this demonstration which include airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the wind event, such as within northern Mexico. (**Figure 2-8)**.

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

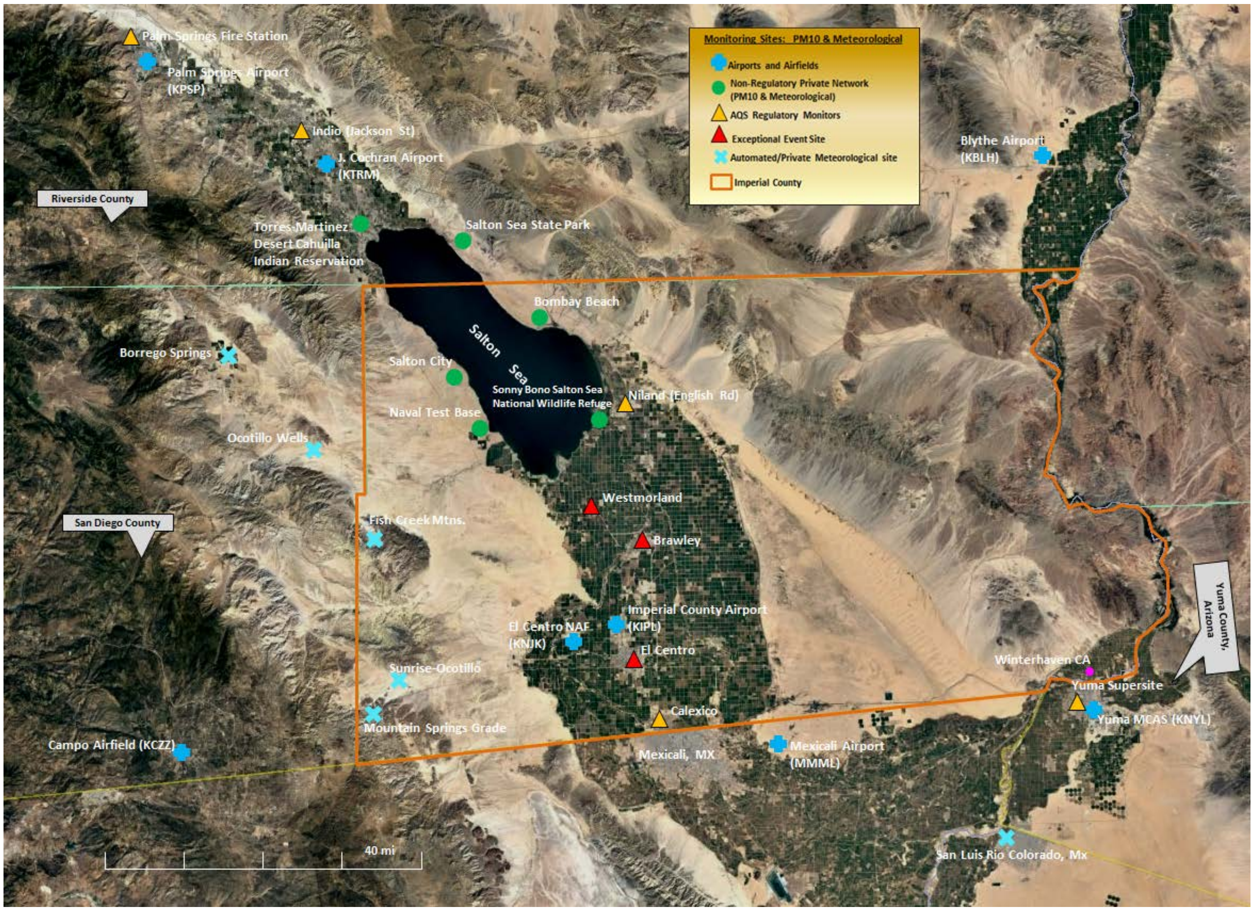


Fig 2-8: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support of an Exceptional Event Demonstration. Source: Google Earth

In addition to meteorological sites, there are non-regulatory PM_{10} sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These stations are privately owned and non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062˚W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593˚W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and 115.62310˚W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. Site photos can be seen at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST

Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe.
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION

Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST

Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe.
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION

Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

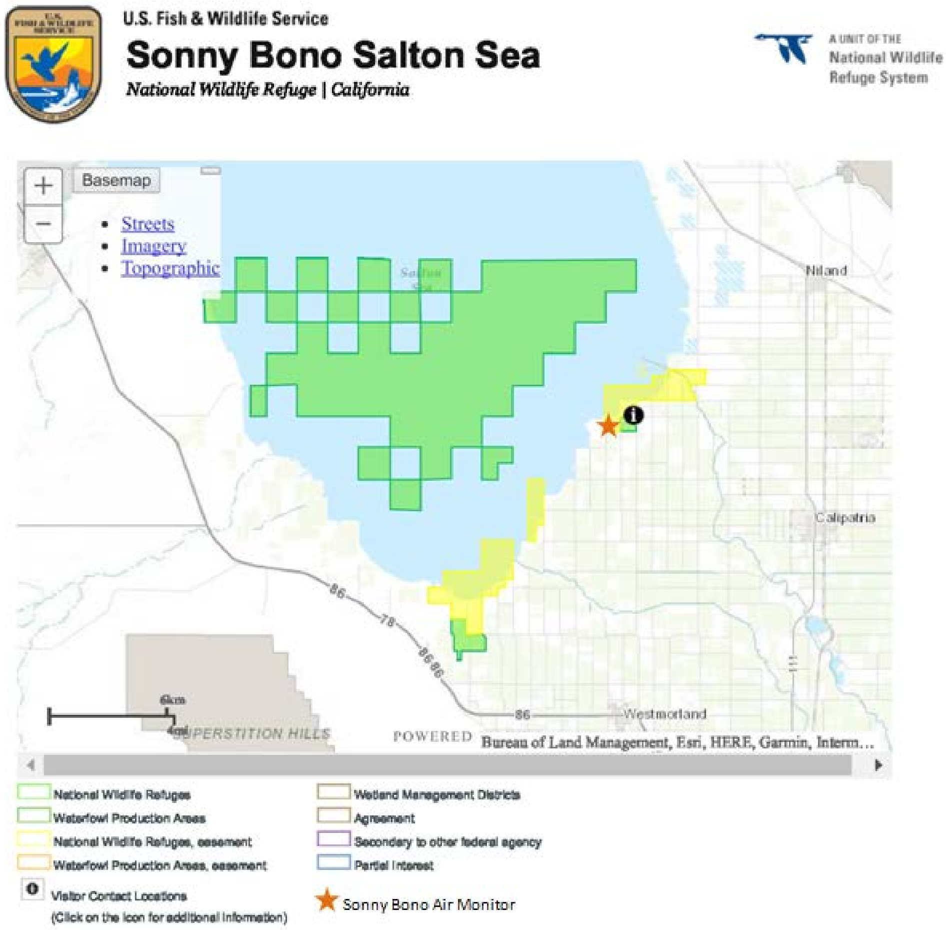


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
APRIL 22, 2016

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	24-hr PM_{10} (µg/m³) Avg	1-hr PM_{10} (µg/m³) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY											
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	(81102)	13701	-15	-	-	-	-	-
		BAM 1020					242	995	19:00		
Calexico-Ethel Street	CARB	BAM 1020	06-025-0005	(81102)	13698	3	87	338	22:00	11.3	22:00
El Centro-9th Street	ICAPCD	BAM 1020	06-025-1003	(81102)	13694	9	86	269	23:00	7.4	16:00
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	(81102)	13997	-57	-	-	-	23.9	17:00
		BAM 1020					115.2	820	17:00		
Westmorland	ICAPCD	BAM 1020	06-025-4003	(81102)	13697	-43	193	917	18:00	15	22:00
RIVERSIDE COUNTY											
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	23.7	41	17:00	10	16:00
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	62	0:00	16:00	15	16:00
ARIZONA – YUMA											
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	60	44.5	112	12:00	-	-

*CARB = California Air Resources Board
*ICAPCD = Air Pollution Control District, Imperial County
*SCAQMD = South Coast Air Management Quality District
*ADEQ =Arizona Department of Environmental Quality

**Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km^2). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

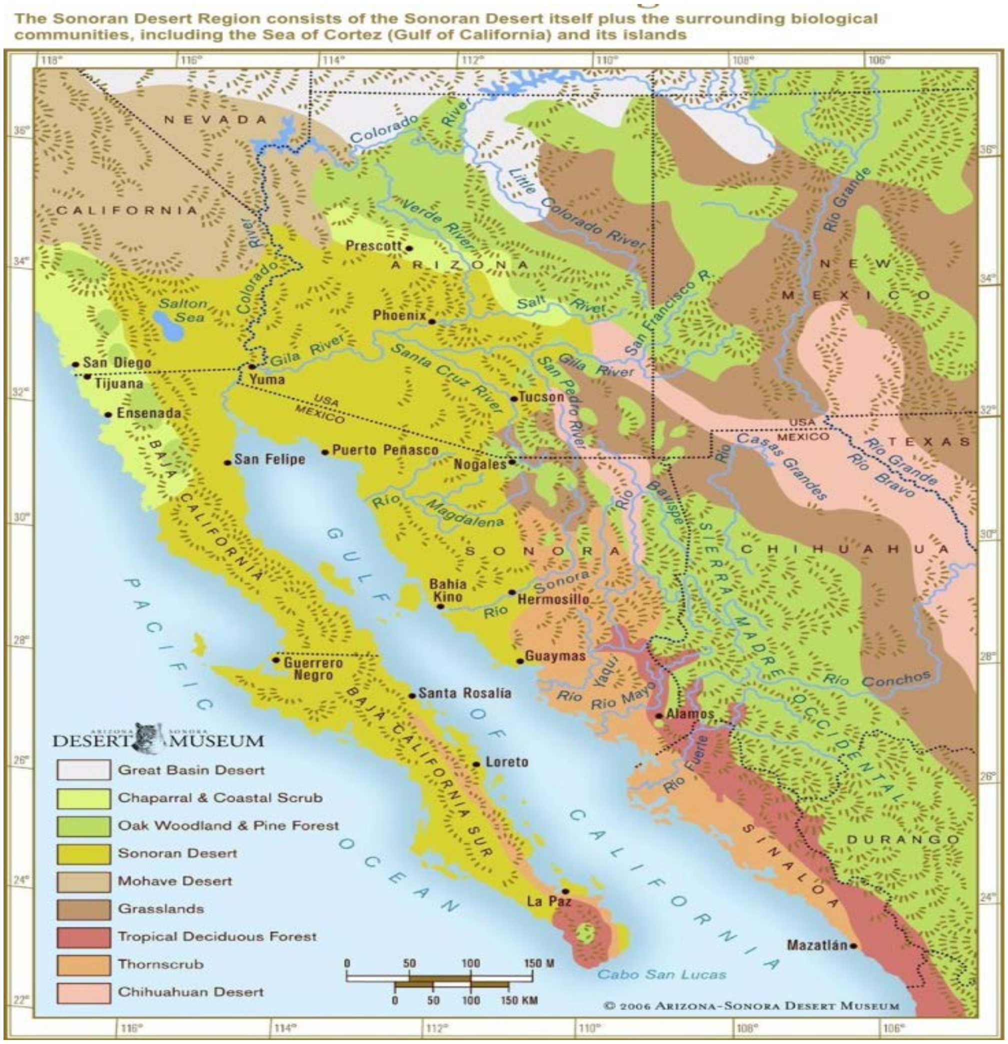


Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 2.64” (**Figure 2-16)**. During the 12-month period prior to April 22, 2016 Imperial County measured total annual precipitation of only 1.3 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

FIGURE 2-16
IMPERIAL COUNTY HISTORICAL WEATHER

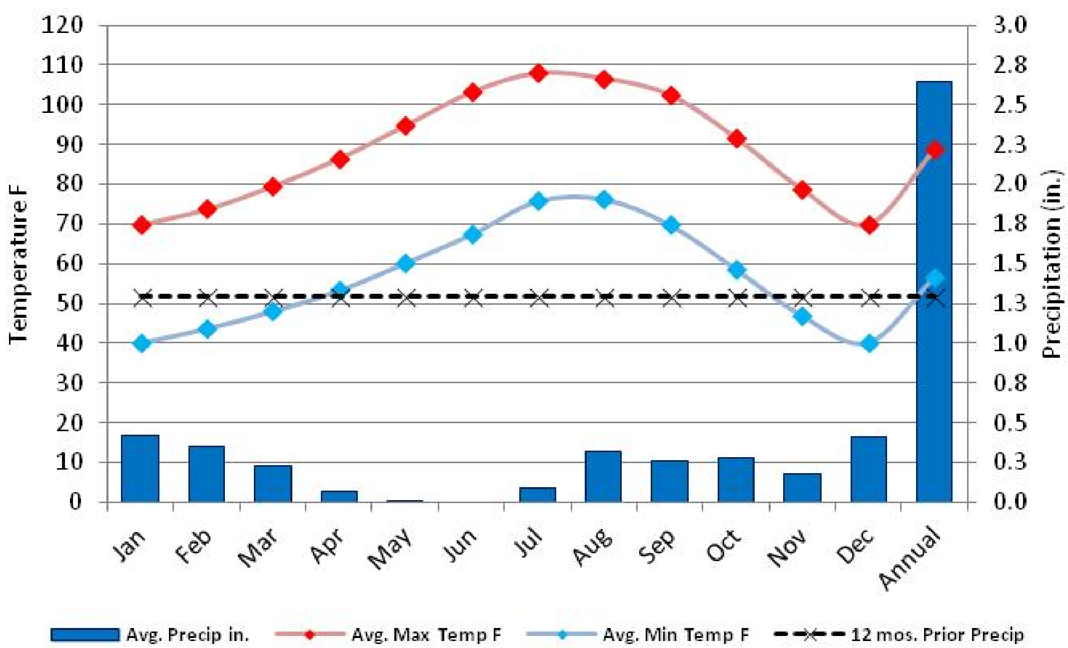


Fig 2-16: Historical Imperial County weather. Prior to April 22, 2016, the region had suffered abnormally low total precipitation of 1.3 inches. Average annual precipitation is 2.64 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground http://www.wrcc.dri.edu/cgi-bin/climain.pl?ca2713

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.[4] Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

Typically, high pressure brings clear skies and with no clouds there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high-pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable west winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for April 22, 2016 was caused by an upper level trough that moved inland from the Pacific over northern California dropping southeast into southern California, created the tightening surface gradients. This in turn created gusty southwest-to-westerly winds across the mountains and deserts of southeastern California and into Imperial County. On April 22, 2106 a mostly dry cold front accompanied a weather system with winds up to 30 mph with gusts reaching 36 mph affecting monitors in Imperial County.

Figures 2-17 through 2-19 illustrates the disturbance moving into the region, the tightening of surface gradients, and the resulting winds.

[4] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html

FIGURE 2-17
UPPER LEVEL TROUGH APPROACHES REGION

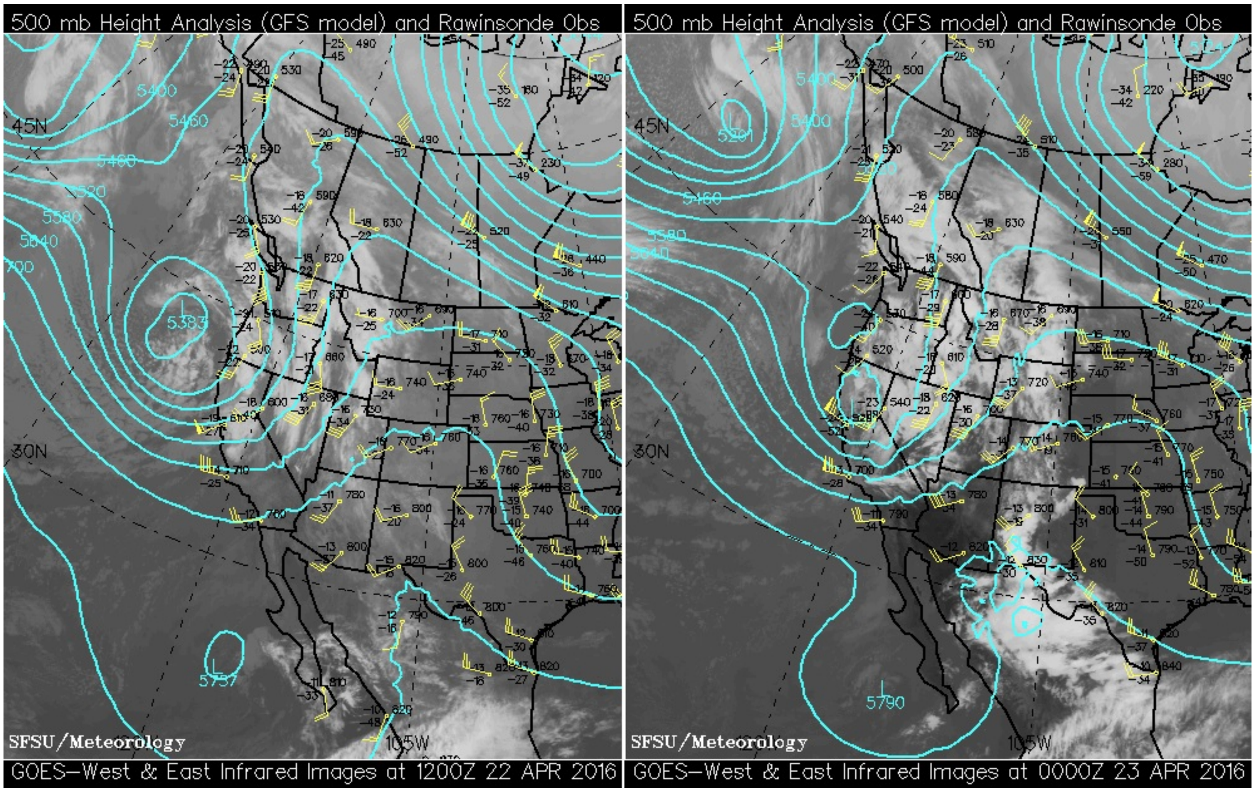


Fig 2-17: A pair of GOES E-W infrared satellite images (left, 0400 PST; right, 1600 PST April 22, 2016) at the 500mb height that show the upper level trough moving inland over northern California and dropping southeast. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server; http://virga.sfsu.edu/archive/composites/sathts_500/1604

FIGURE 2-18
SURFACE GRADIENT TIGHTENS

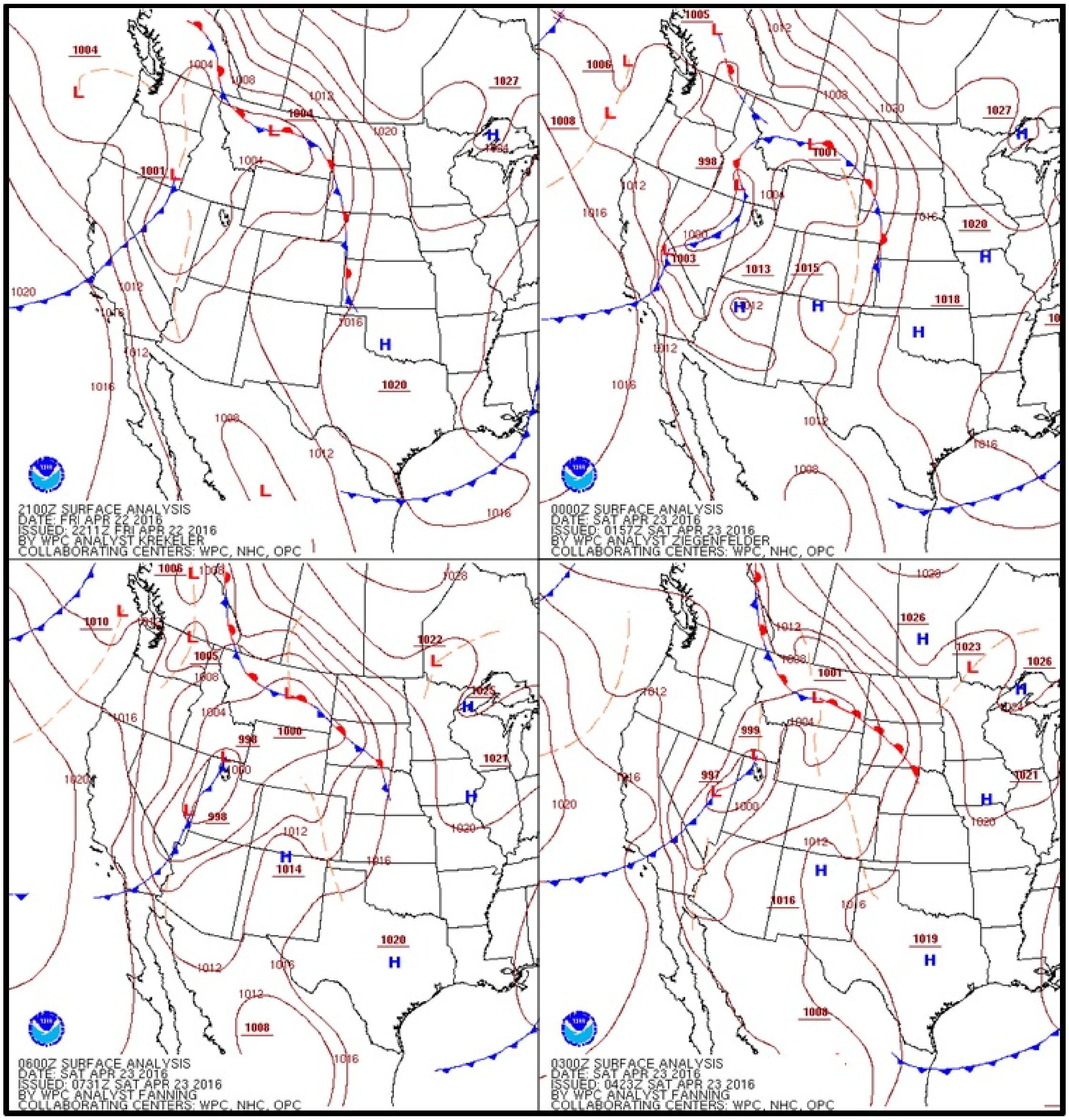


Fig 2-18: A quad of surface analysis maps show the modest tightening of the surface gradient during April 22, 2016 that was responsible for the gusty winds across southeastern California and Imperial County. Also visible is the cold front moving across southern California. Clockwise, from top left: 1300 PST; 1600 PST; 1900 PST; 2000 PST. Gusty winds began in the late afternoon and continued into the evening. Source: NWS Weather Prediction Center Surface Analysis Archive

FIGURE 2-19
SURFACE GRADIENT REMAINS PACKED

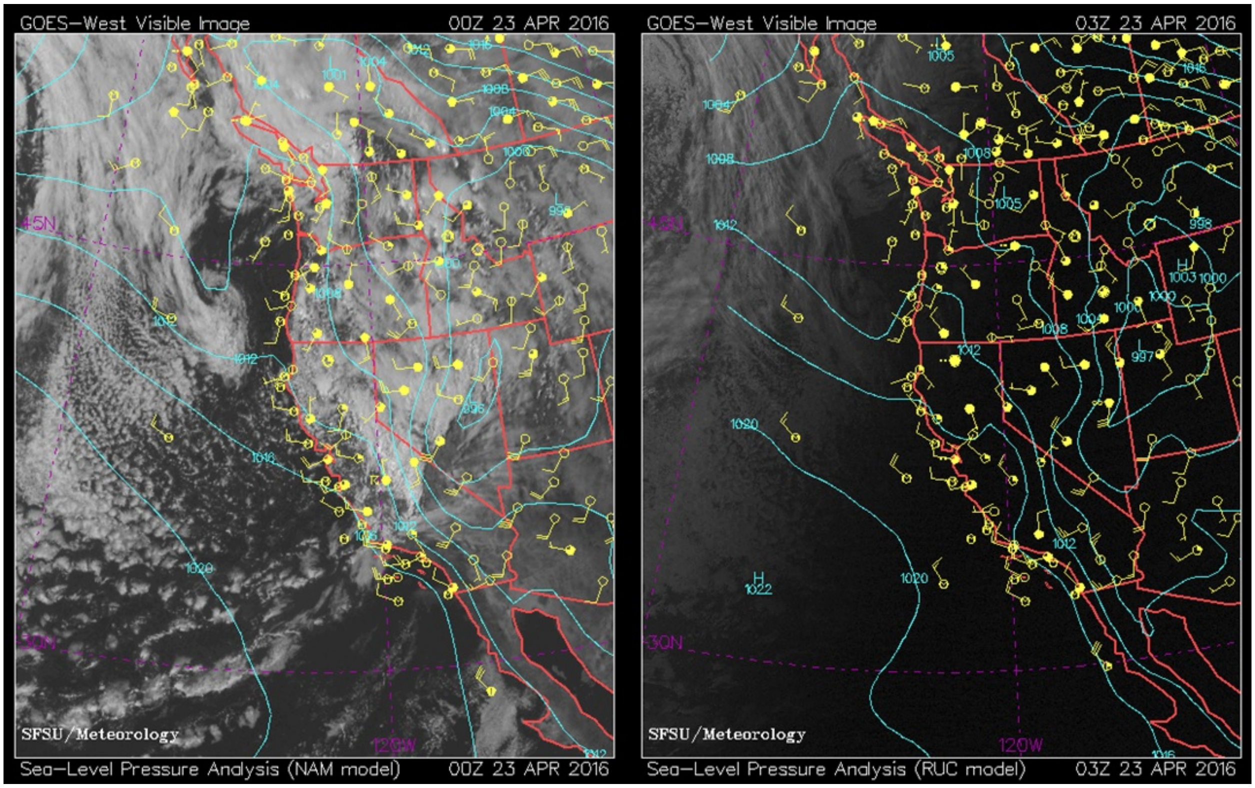


Fig. 2-19: A pair of GOES-W visible (left) and infrared (right) satellite images captured at 1600 PST and 1900 PST on April 22, 2016. This was during the period Imperial County Airport and El Centro NAF were reporting gusty winds. Wind barbs in the right image (1900 PST) depict southwest winds of at least 28.3 mph. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server; http://squall.sfsu.edu/crws/archive/wcsathts_arch.html

Figure 2-20 illustrates the ramp up to the event day. Up through mid-day winds were light and mostly variable as measured at El Centro NAF (KNJK) and Imperial County Airport (KIPL). By midafternoon winds shifted westerly, with measurable increase in speeds and gusts. Both the El Centro NAF (KNJK) and the Imperial County Airport (KIPL) measured wind speeds above the 25 mph threshold. KNJK measured three hours above the threshold with gusts peaking at 30 mph and 36 mph and KIPL measured one hour above the threshold with peak winds of 26 mph and gusts of 33 mph. By 1800 Westmorland's hourly PM_{10} concentration peaked at 917 µg/m^3. At 1900 Brawley's PM_{10} peaked at 995 µg/m^3.

FIGURE 2-20
RAMP UP ANALYSIS APRIL 22, 2016

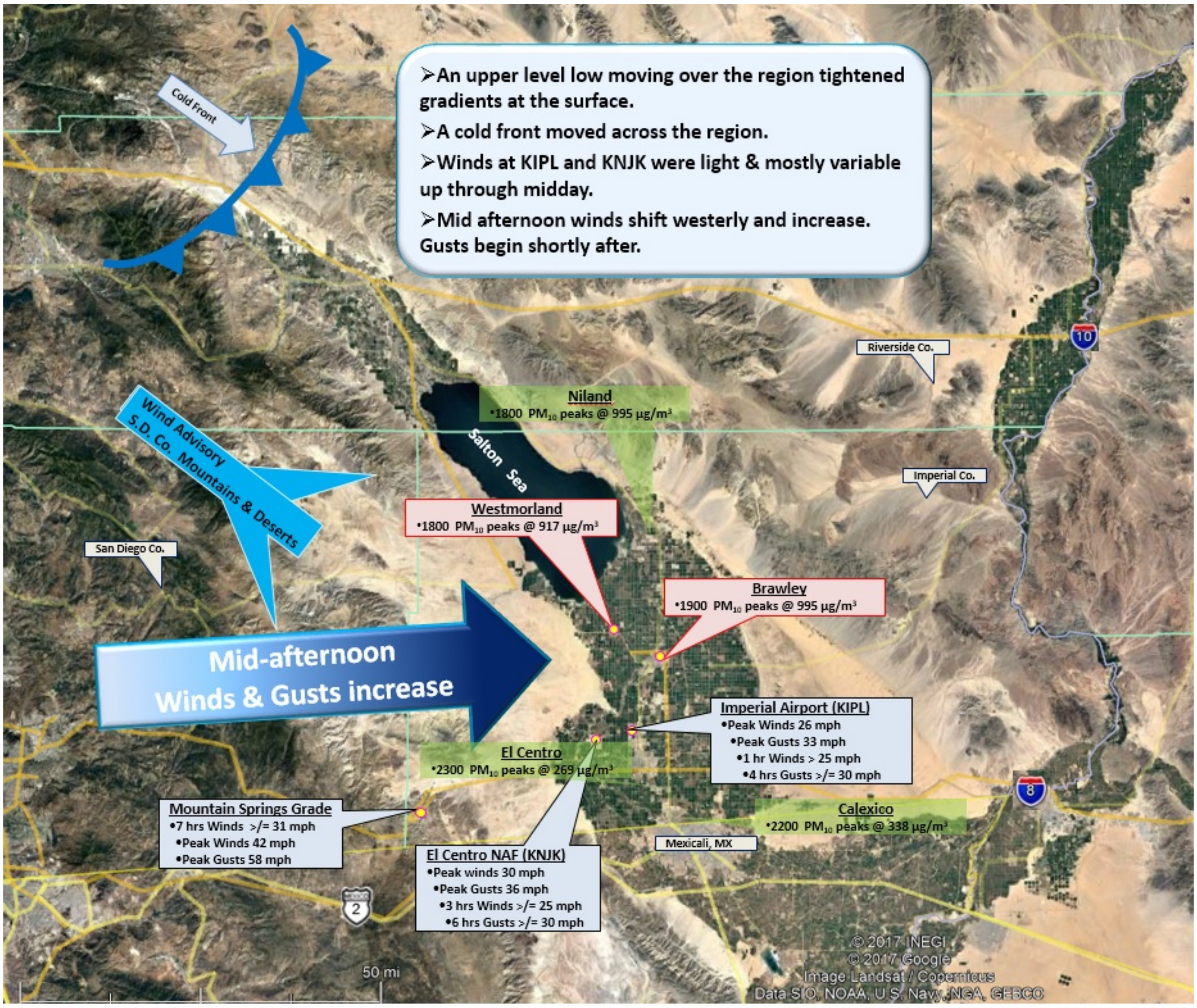


Fig 2-20: Light and variable winds up through midday turned westerly and increased steadily through the afternoon. Entrained fugitive dust downstream into Imperial County caused exceedances at Westmorland and Brawley monitors. Air quality data from the EPA's AQS databank. Wind data from the NCEI's QCLCD system. Google Earth base map

Table 2-2 has a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali, Mexico. For detailed station meteorological graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON APRIL 22, 2016

Station Monitor Airport Meteorological Data	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	*Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM10 correlated to time of Max Wind Speed		
						Wstmd	Brly	Nlnd
IMPERIAL COUNTY								
Imperial Airport (KIPL)	26	250	18:53	33	18:53	917	378	-
Naval Air Facility (KNJK)	30	260	18:56	36	18:56	917	378	-
Calexico (Ethel St)	11.3	53	22:00	-	-	204	519	105
El Centro (9th Street)	7.4	257	16:00	-	-	355	102	101
Niland (English Rd)	23.9	261	17:00	-	-	713	509	820
Westmorland	15	279	22:00	-	-	204	519	105
RIVERSIDE COUNTY								
Blythe Airport (KBLH)	25	200	15:52	33	12:52	85	41	32
Palm Springs Airport (KPSP)	21	340	17:53	29	17:53	713	509	820
Jacqueline Cochran Regional Airport (KTRM) - Thermal	28	330	12:52	40	12:52	30	24	24
ARIZONA - YUMA								
Yuma MCAS (KNYL)	24	170	11:57	29	11:57	37	21	20
MEXICALI - MEXICO								
Mexicali Int. Airport (MXL)	20.9	130	14:41	-	-	32	41	23

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

The National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory model,[5] depicted in **Figure 2-21** is a back-trajectory ending at Brawley (red icon) and Westmorland (blue icon) in the 12 hours leading up to peak concentrations at the Westmorland monitor at 1800 PST (Brawley reached peak concentrations an hour later). It should be noted that modeled winds can differ from local conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km and is integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

[5] The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's MODIS satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

FIGURE 2-21
NOAA HYSPLIT MODEL APRIL 22, 2016

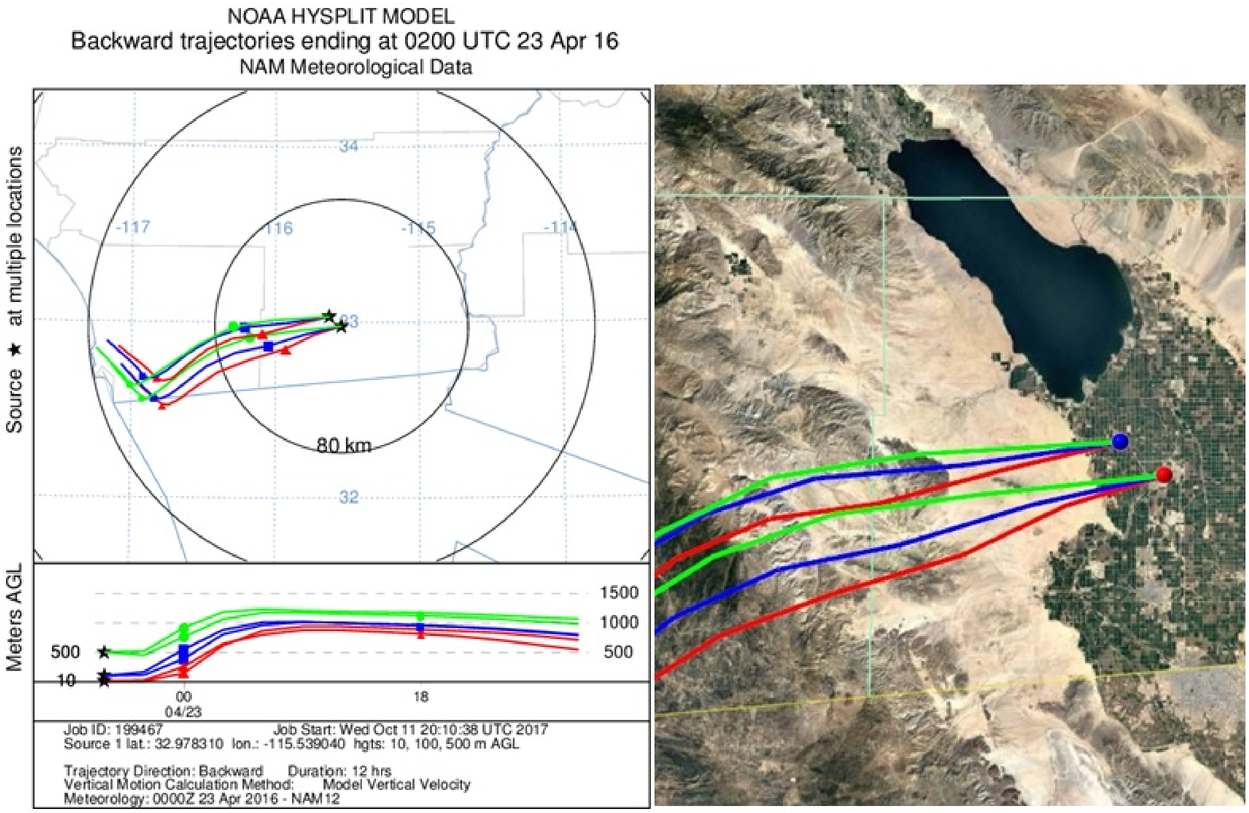


Fig 2-21: A 12-hour back trajectory ending at 1800 PST. This was during the period that both Brawley and Westmorland FEM monitors were reporting high hourly concentrations. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100 m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figures 2-22 and 2-22 illustrate the winds and elevated levels of hourly PM_{10} concentrations measured in Riverside, Imperial and Yuma Counties a total of three day, April 21, 2016 through April 23, 2016. Elevated emissions entrained into Imperial County affected all monitors in Imperial County when gusty west winds that were associated with the passage of a cold front passed through Imperial County on April 22, 2016. Measured hourly maximums (**Table 2-2**) provide correlating causal effect with wind speeds and gusts. The Westmorland and Niland monitors measured maximum concentrations as early as 1800 PST (917 µg/m^3 and 995 µg/m^3). The Brawley monitor measured its maximum concentration an hour later, at 1900 PST (995 µg/m^3) followed by the Calexico and El Centro monitors each respectively at 2200 and 2300 PST (338 µg/m^3 and 269 µg/m^3). Notably, the highest concentrations occurred at the northern section of Imperial County where topography played a crucial role, open space with few obstructions.

The resulting entrained dust and accompanying high winds from the system qualify this event as a "high wind dust event".[6] High wind dust events are considered natural events where the windblown dust is either from solely a natural source or from areas where anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the April 22, 2016 high wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event.

FIGURE 2-22
72 HOUR WIND SPEEDS REGIONAL SITES

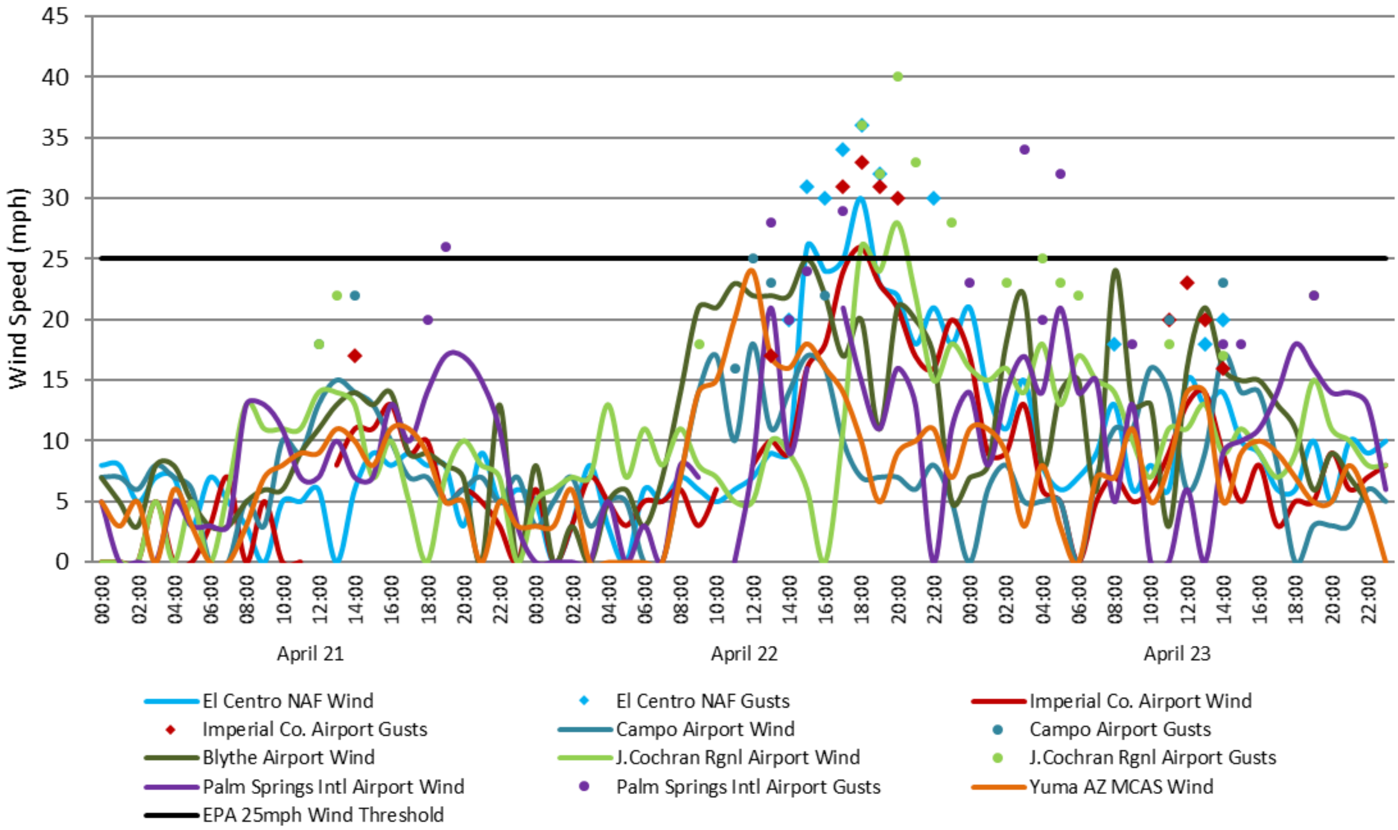


Fig 2-22: Is the graphical representation of the 72 hour measured wind speeds and gusts at various sites including regional airfields in California and Arizona. The graph illustrates the number of hours where measured winds speeds and wind gusts where above 25 mph. Airports, such as the Imperial County Airport, El Centro NAF and Jacqueline Cochran Regional Airport measured winds above the 25 mph threshold. Wind Data from the NCEI's QCLCD system

[6] Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

FIGURE 2-23
72 HOUR PM_{10} CONCENTRATIONS AT VARIOUS SITES

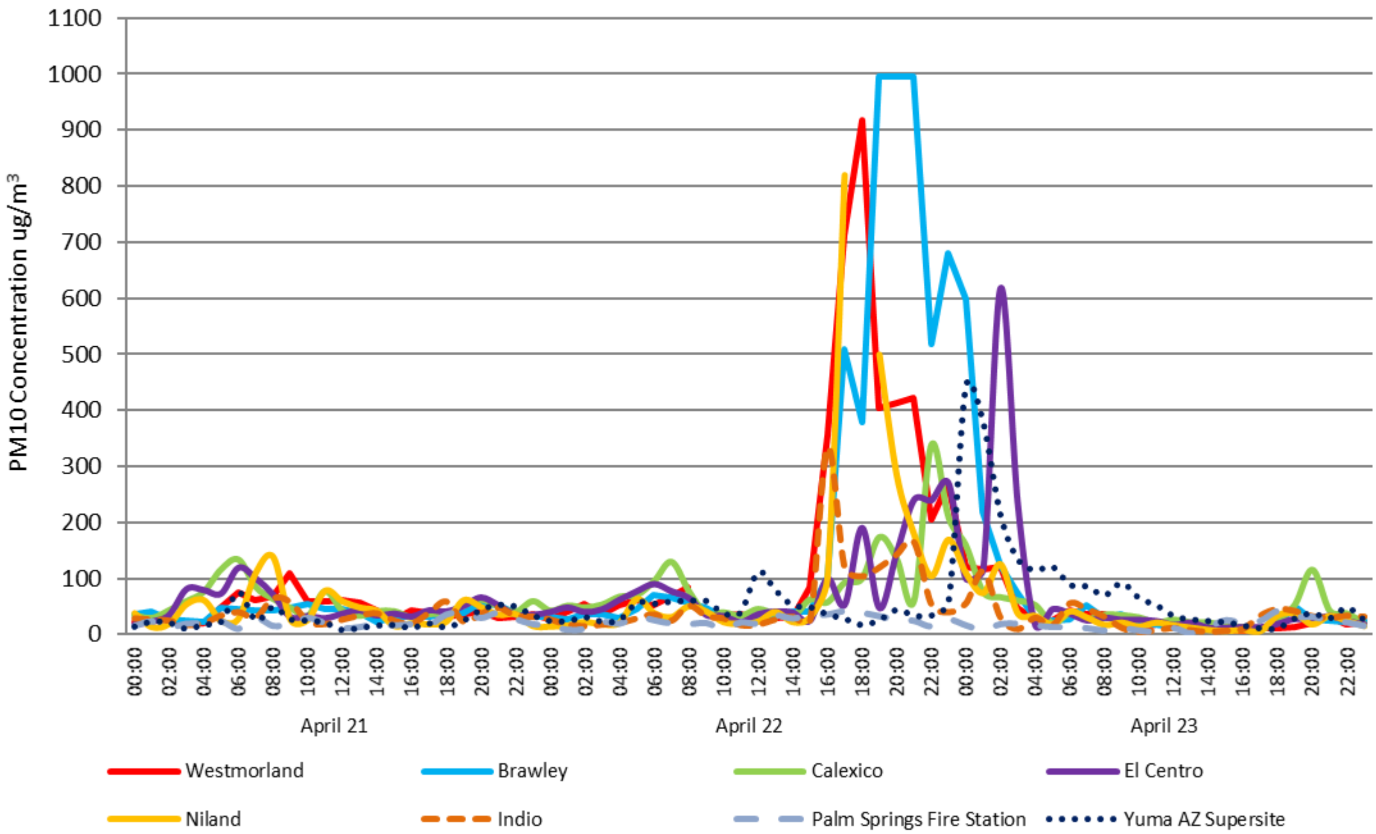


Fig 2-23: Is the graphical representation of the 72 hour relative PM_{10} concentrations at various sites in California and Arizona. The PM_{10} concentrations at all sites on April 22, 2016 are elevated, albeit some are not as significantly elevated as the Brawley and Westmorland sites but still elevated above 100 µg/m^3. Finally, graph illustrates the regional affect by the weather system upon concentrations. Air quality data from the EPA's AQS data bank

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Brawley and Westmorland monitors on April 22, 2016, were compared to non-event and event days demonstrating the variability over several years and seasons. The analysis, also, provides supporting evidence that there exists a clear causal relationship between the April 22, 2016 high wind event and the exceedance measured at the Brawley and Westmorland monitors.

Figures 3-1 through 3-4 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Brawley and Westmorland stations for the period of January 1, 2010 through April 22, 2016. Note that prior to 2013, the BAM data was not considered FEM and was not reported into AQS.[7] In order to properly establish the variability of the event as it occurred on April 22, 2016, 24-hour averaged PM_{10} concentrations between January 1, 2010 and April 22, 2016 were compiled and plotted as a time series. All four figures illustrate that the exceedances, which occurred on April 22, 2016, were outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs obtained through the EPA's AQS data bank.

[7] Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM_{10} concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m3) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM_{10} concentrations to PM_{10} concentrations with in this demonstration.

FIGURE 3-1
BRAWLEY HISTORICAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 22, 2016

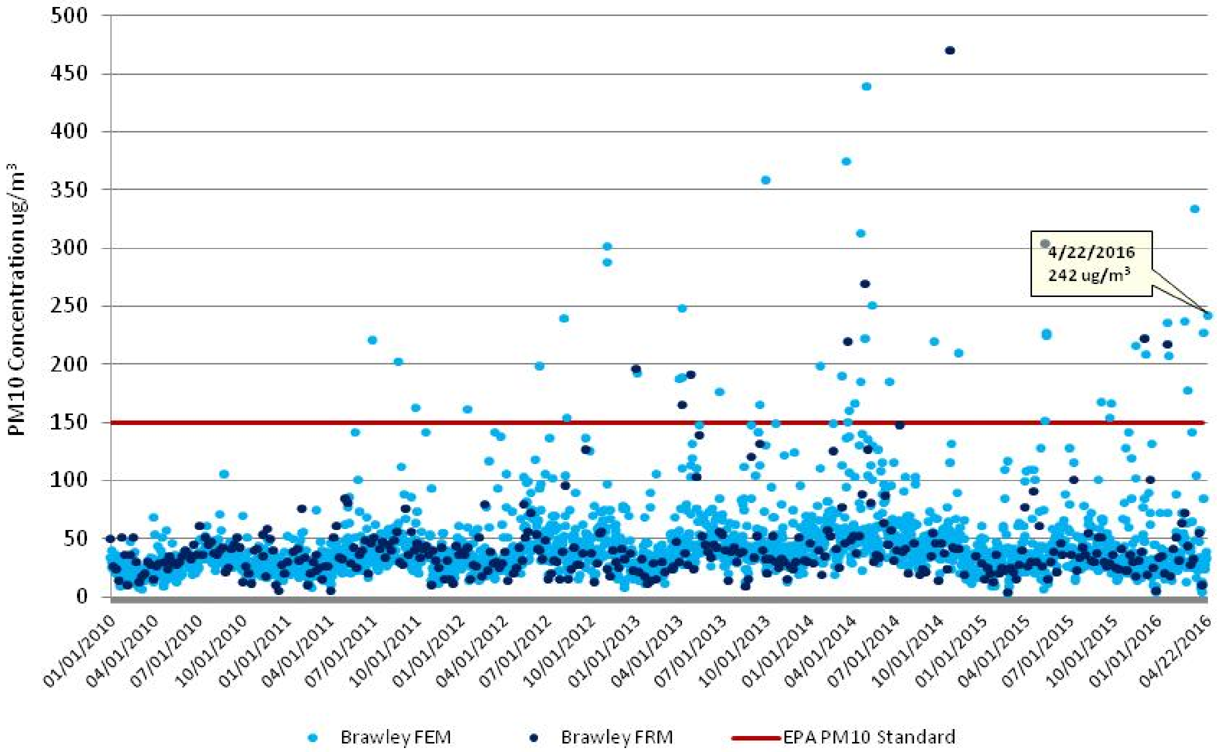


Fig 3-1: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 242 µg/m^3 by the Brawley monitor was outside the normal historical concentrations when compared to event days and non-event days

FIGURE 3-2
WESTMORLAND HISTORICAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 22, 2016

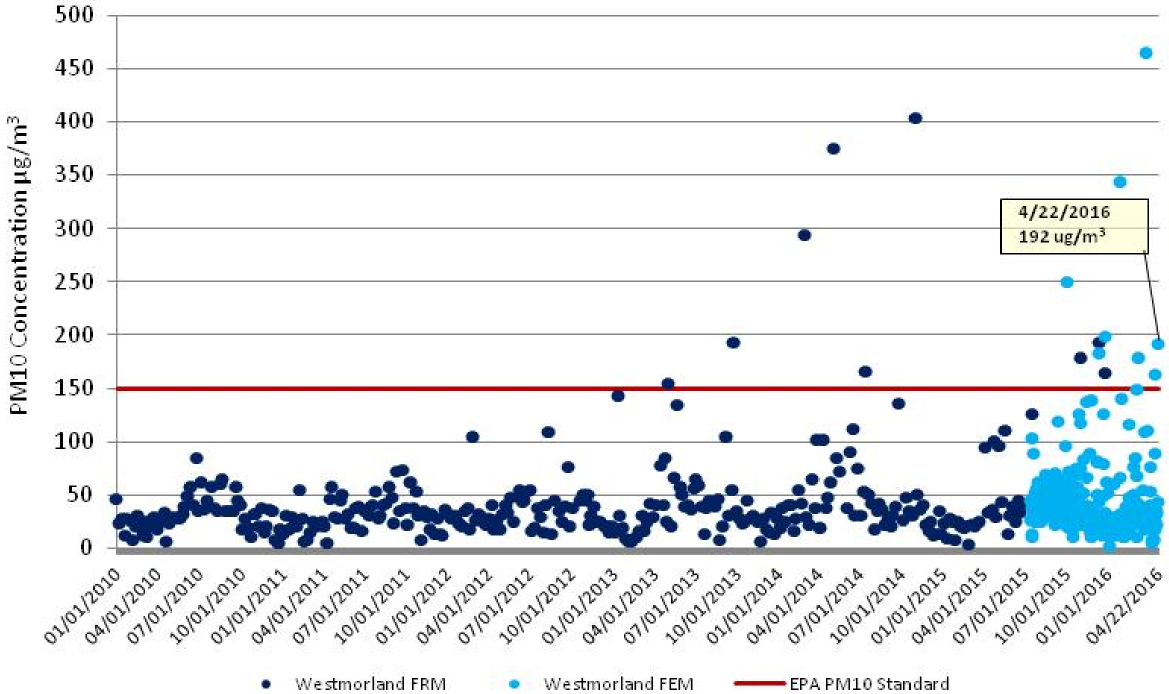
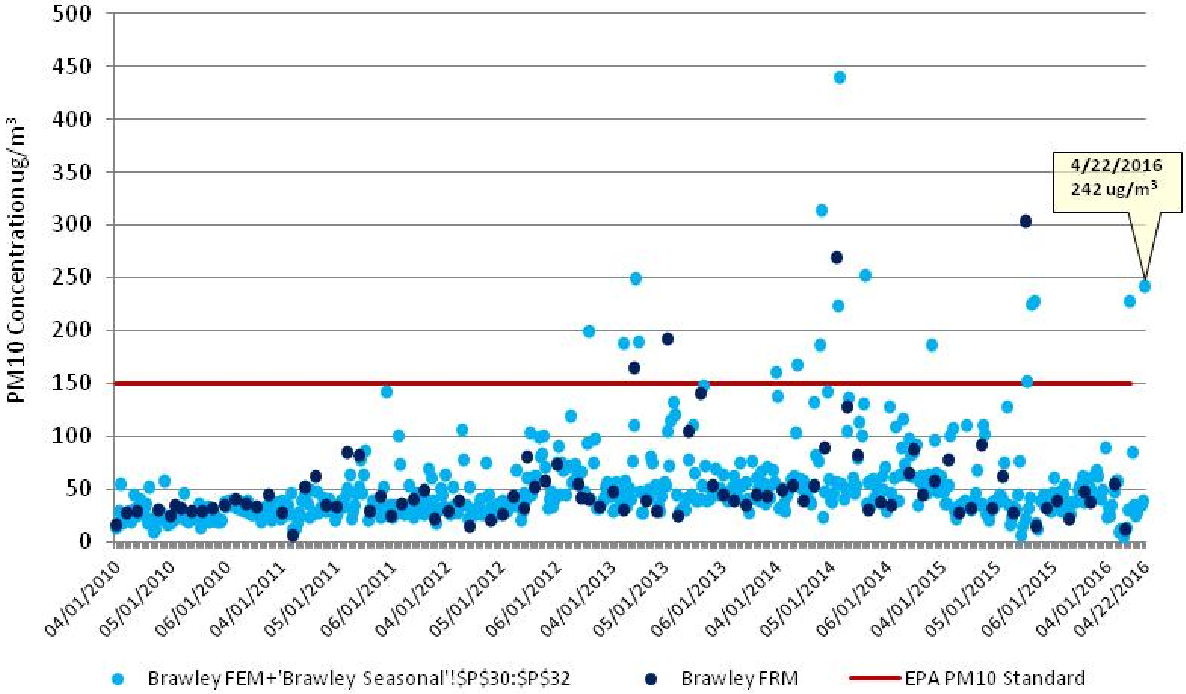


Fig 3-2: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 192 µg/m³ by the Westmorland monitor was outside the normal historical concentrations when compared to event days and non-event days

The time series, **Figures 3-1 through 3-2** for Brawley and Westmorland, included 2,304 sampling days (January 1, 2010 through April 22, 2016). During this period the Brawley station measured 2,668 credible samples, measured by either FRM or FEM monitors between January 1, 2010 and April 22, 2016.

Overall, the time series illustrates that of the 2,397 credible samples measured during there was a total of 45 exceedance days, which is a 1.7% occurrence rate. The Westmorland station measured 640 credible samples measured by either FRM or FEM monitors between January 1, 2010 and April 14, 2016. Only 16 exceedance days were measured during this period. This translates into just 2.5% of all samples. As mentioned above, FEM BAM data was not regulatory from 2010 to 2012.

FIGURE 3-3
BRAWLEY SEASONAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS S
***APRIL 1, 2010 TO JUNE 30, 2016**

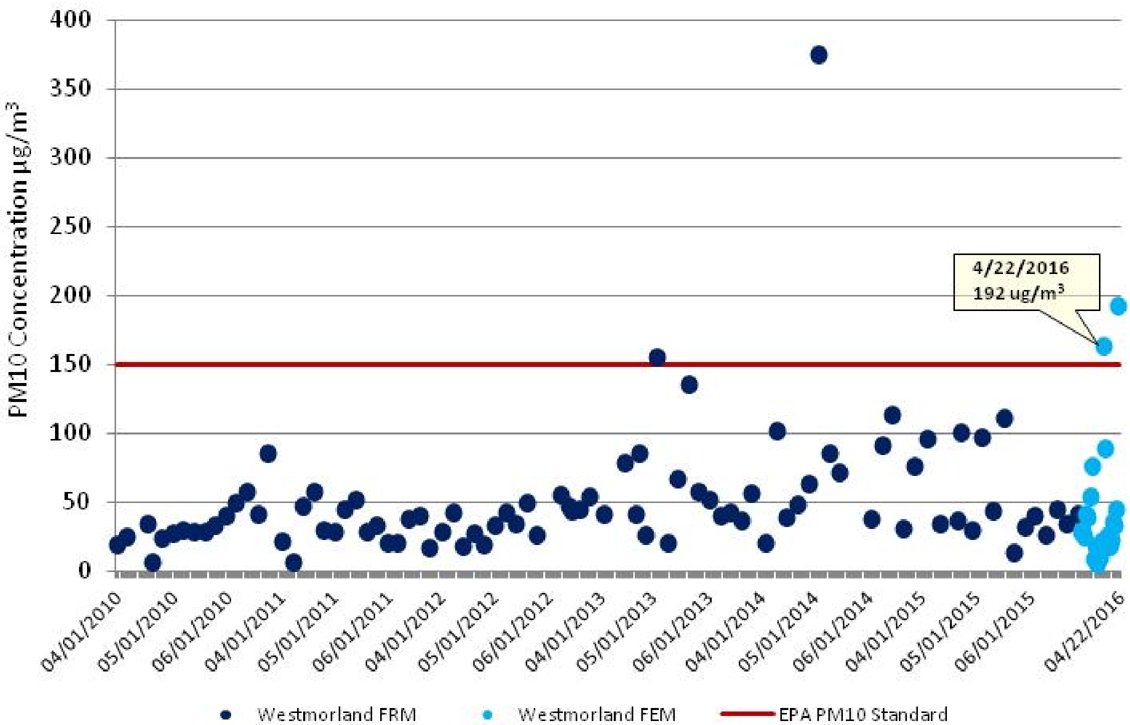


*The dataset includes 2nd quarter samples April 1, 2010 through June 30, 2015, plus April 1, 2016 through April 22, 2016

***Quarterly: April 1, 2010 to April 30, 2015 and April 1, 2016 to April 22, 2016**

Fig 3-3: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 242 µg/m³ by the Brawley monitor on April 22, 2016 was outside the normal seasonal concentrations when compared to event days and non-event days

FIGURE 3-4
WESTMORLAND SEASONAL COMPARISON
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
***APRIL 1, 2010 T0 JUNE 30, 2016**



***Quarterly: April 1, 2010 to April 30, 2015 and April 1, 2016 to April 22, 2016**

Fig 3-4: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 192 µg/m^3 by the Westmorland monitor on April 22, 2016 was outside the normal seasonal concentrations when compared to event days and non-event days

Figures 3-3 through 3-4 display the seasonal fluctuations over 560 sampling days at the Brawley and Westmorland stations for months April through June of years 2010 through 2016 (2016 ending April 14). The seasonal sampling period for Brawley (**Figure 3-3**) contains 650 combined FRM and FEM credible samples. Of these, only 17 exceedance days occurred which translates into just 2.6% of all samples. The seasonal sampling period[8] for Westmorland (**Figure 3-4**) contains 102 credible samples and only three exceedance days. This equates to 2.9% of all credible samples.

[8] FEM sampling at the Westmorland site began July 2015 therefore January is the only seasonal first-quarter data available.

FIGURE 3-5
BRAWLEY HISTORICAL
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 22, 2016

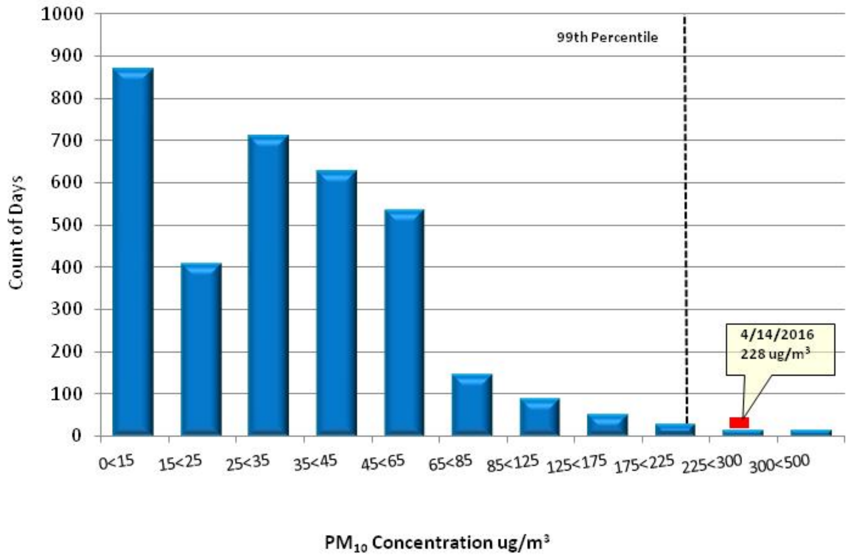


Fig 3-5: The 24-hr average PM_{10} concentration at the Brawley monitoring site demonstrates that the concentration of 242 µg/m^3 falls above the 99th percentile.

FIGURE 3-6
WESTMORLAND HISTORICAL
FRM AND FEM PM_{10} 24 HOUR AVG CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 22, 2016

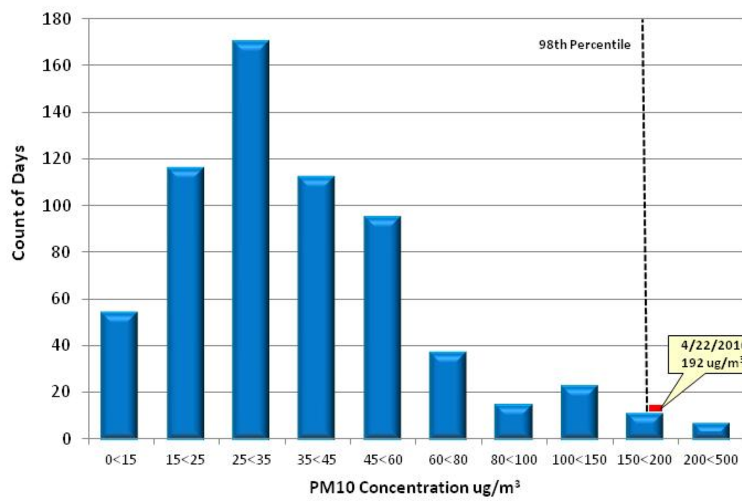


Fig 3-6: The 24-hr average PM_{10} concentration at the Westmorland monitoring site demonstrates that the concentration of 192 µg/m^3 was in excess of the 98th percentile.

For the combined FRM and FEM data sets, the annual historical and the seasonal historical PM_{10} concentrations of 242 µg/m^3 for Brawley and the 192 µg/m^3 for Westmorland are all in excess the 99th and 98th percentile rankings, respectively. Looking at the annual time series concentrations, the seasonal time series concentrations, and the percentile rankings for both the historical and seasonal patterns, the April 22, 2016 measured exceedances are clearly outside the normal concentration levels when comparing to non-event days and event days.

III.2 Summary

The information provided, above, by the time series plots, seasonal time series plots, and the percentile rankings illustrate that the PM_{10} concentration observed on April 22, 2016 occurs infrequently. When comparing the measured PM_{10} levels on April 22, 2016 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Brawley and Westmorland monitoring sites were outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the April 22, 2016 natural event affected the concentrations levels at the Brawley and Westmorland monitors causing an exceedance. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedances on April 22, 2016 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the "not reasonably controllable or preventable" (nRCP) criterion as two prongs. To address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures to consider the measures as enforceable. USEPA considers control measures enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for "high wind events" when PM_{10} concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a "natural event" where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for April 22, 2016. In addition, this April 22, 2016 demonstration provides technical and non-technical evidence that strong and gusty westerly winds blew across the mountains and deserts within southeastern California and into Imperial County suspending particulate matter affecting the Brawley and Westmorland monitors on April 22, 2016. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the April 22, 2016 EE.

IV.1 Background

Inhalable particulate matter (PM_{10}) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM_{10} from sources of fugitive dust on October 10, 1994, and revised them on November 25, 1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM_{10}. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006 ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

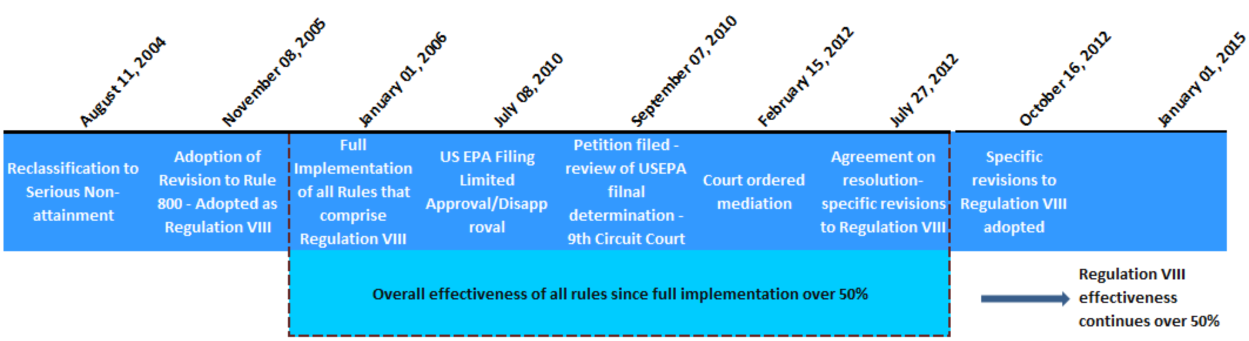


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

A brief summary of Regulation VIII, which is comprised of seven fugitive dust rules, is found below. **Appendix D** contains a copy of the complete set of rules.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM_{10} from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generates dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM_{10} events by:

- Protecting public health;
- Educating the public about high wind events;

- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines were revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On April 22, 2016 the ICAPCD declared a Limited Burn day **(Appendix A).** No complaints were filed for agricultural burning on April 22, 2016.

IV.1.c Review of Source Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County and specifically around Westmorland and Brawley during the April 22, 2016 PM_{10} exceedance. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land

Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. There were no filed agricultural or waste burning or dust complaints on April 22, 2016 officially declared as a "Limited Burn day". While individuals may burn miscellaneous or waste during designated limited burn days, no agricultural field burning may occur.

FIGURE 4-2
PERMITTED SOURCES

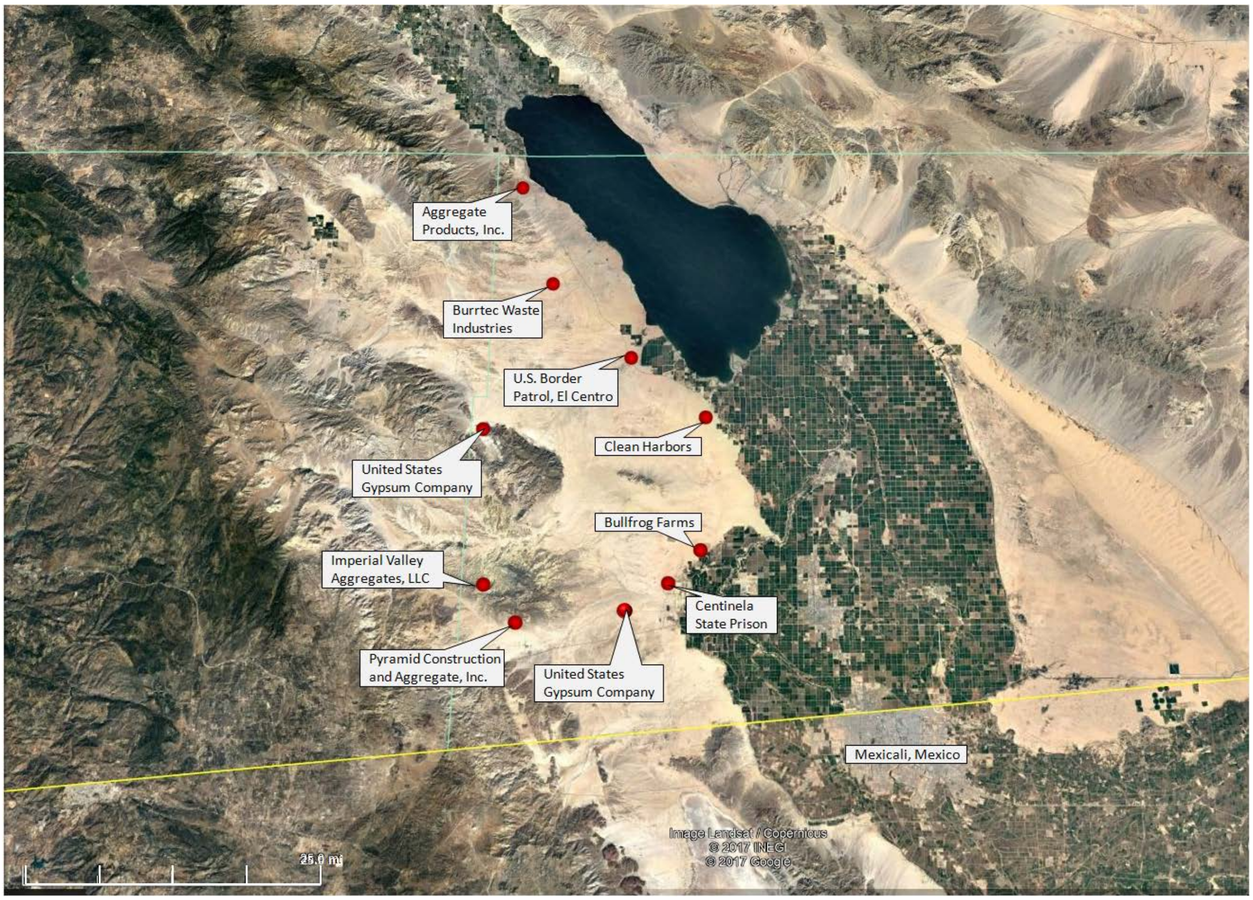


Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Westmorland and Brawley monitors. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition, the Bureau of Land Management or the California Department of Parks manages the desert areas. Base map from Google Earth

FIGURE 4-3
NON-PERMITTED SOURCES

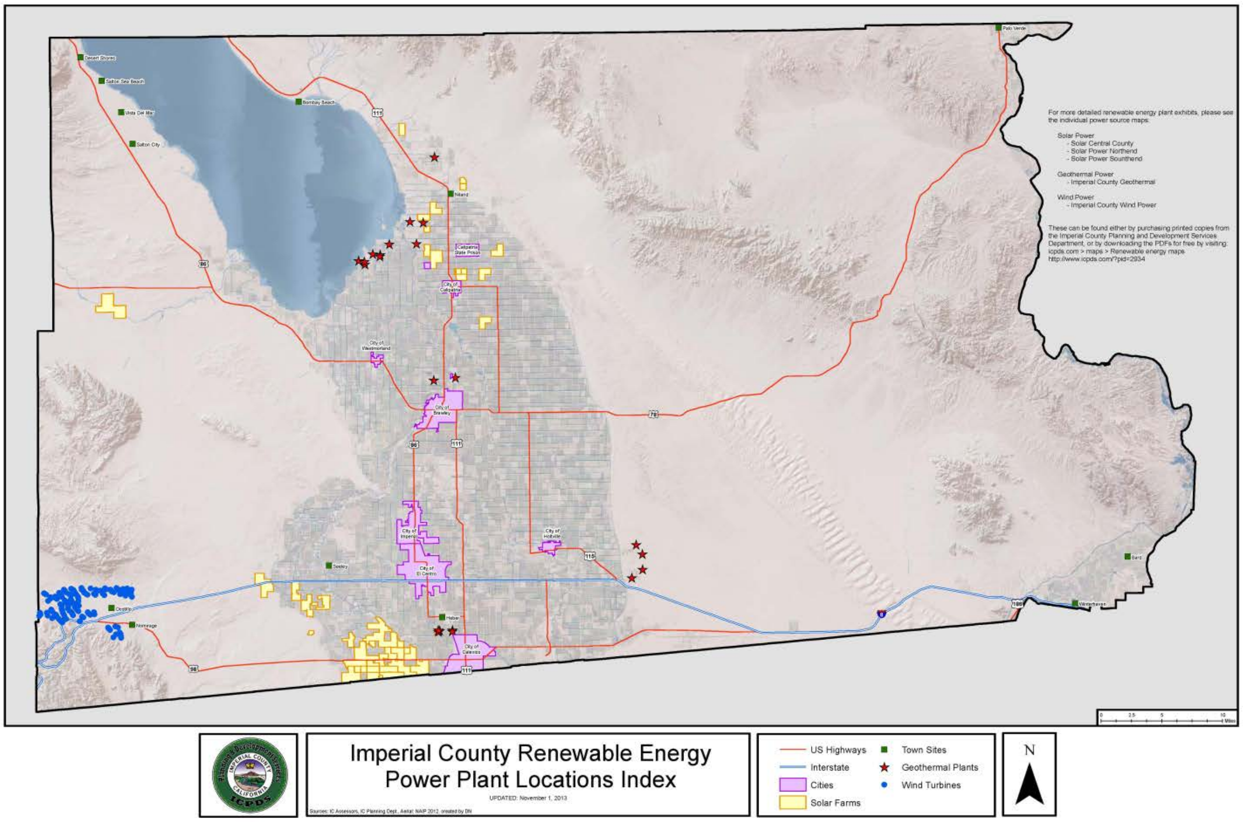


Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Westmorland and Brawley monitors. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants.

IV.2 Forecasts and Warnings

A Wind Advisory[9] was issued at 1:42 a.m. on April 21 by the NWS San Diego office for portions of San Diego County that included the desert areas. Southwest winds of 25 to 35 mph with gusts up to 60 mph were expected. Strongest winds were expected to be along desert slopes. Blowing sand was expected in the desert. These areas were upstream of Imperial County during the April 22, 2016 wind event.

On April 21, 2016 the ICAPCD posted on its website a combined weather story and forecast from the NWS San Diego office regarding the high winds that were forecast for April 22, 2016, along with possible blowing dust and sand in the deserts. A similar weather story and forecast was posted on April 22, 2016 (**Appendix A**). The notice also carried an advisory that high winds had

[9] A wind advisory is issued when the following conditions are met for one (1) hour or longer: 1) sustained winds of 31 to 39 mph, and/or; 2) wind gusts of 46 to 57 mph for any duration. Source: NWS, 2016; http://www.weather.gov/lwx/WarningsDefined#WindAdvisory.

the potential to suspend particulate matter into the air, and possibly pose an impact to public health.

IV.3 Wind Observations

Airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County each measured wind data. Automated meteorological instruments upstream from the Brawley and Westmorland monitors similarly measured wind data during the wind event. El Centro NAF (KNJK) had three hours of winds at or above 25 mph. Imperial County Airport (KIPL) had one hour of winds above 25 mph. Gusts along the desert slopes west of Imperial County reached 58 mph. Wind speeds of 25 mph are normally sufficient to overcome most PM_{10} control measures. During the April 22, 2016 event wind speeds were above the 25 mph threshold, overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that high winds accompanying a strong but dry low-pressure system and cold front that moved through southern California lofted dust that caused uncontrollable PM_{10} emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements at or upstream of Brawley and Westmorland monitoring stations during the event were high enough (at or above 25 mph, with wind gusts of 36 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on April 22, 2016 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the high wind event timeline and geographic location. The April 22, 2016 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for April 22, 2016 identified a low-pressure system and associated cold front that moved through the region. A modest tightening of surface pressure gradients led to gusty southwest-to-westerly winds across the mountains and deserts of southeastern California and into Imperial County. Winds up to 30 mph with gusts up to 36 mph entrained fugitive windblown dust from natural areas, particularly from the San Diego Mountains and desert slopes west of the Brawley and Westmorland air monitoring stations, over areas with anthropogenic sources controlled with BACM and into Imperial County. While the effect of elevated concentrations of particulate matter are evident throughout Imperial County (**Table 1-1**) the highest elevated concentrations primarily affected the northern monitors.

TABLE 5-1
IMPERIAL COUNTY MAXIMUM CONCENTRATIONS

MONITOR	AQS CODE	HOUR	MAX
Brawley	06-025-0007	1900	**995**
Calexico	06-025-0005	2200	338
El Centro	06-025-1003	2300	269
Niland	06-025-4004	1800	**995**
Westmorland	06-025-4003	1800	**917**

Source: EPA's AQS data bank

The HYSPLIT trajectories (**Figures 2-21 & 5-5**) and the Ramp-up Analysis (**Figure 2-20**) illustrate how topography, location and wind speed influenced concentrations at the regulatory monitors. The location of the Westmorland and Brawley monitors contributed significantly to the elevated PM_{10} concentrations measured at those sites. Westerly winds traversed a large amount of dry desert region, which entrained fugitive PM_{10}, which was then measured by the Westmorland and Brawley monitors. The Niland monitor had a significantly larger amount of agricultural lands with BACM as well as part of the Salton Sea[10] that the westerly winds had to traverse, hence it measured a lower PM_{10} concentration than both the Westmorland and Brawley monitors. The Calexico and El Centro monitors measured the entrained PM_{10} concentration of the same westerly winds, except that the winds had to traverse agricultural lands with BACM as well as a larger amount of urban area than the winds which affected the northern monitors, hence the Calexico and El Centro monitors measured the lowest PM_{10} concentration of all the monitors. Overall, this event affected the north-end of Imperial County.

Figures 5-1 and 5-2 show the tightening of the surface gradient along with a cold front associated with the weather disturbance that caused gusty westerly winds to entrain fugitive windblown dust.

[10] Kok, Jasper F., et al. "The physics of wind-Blown sand and dust." Reports on Progress in Physics, vol. 75, no. 10, 20 Sept. 2012 & USEPA: https://www.epa.gov/cmaq/air-surface-exchange-process-overview#dust

FIGURE 5-1
SURFACE PRESSURE GRADIENT TIGHTENS

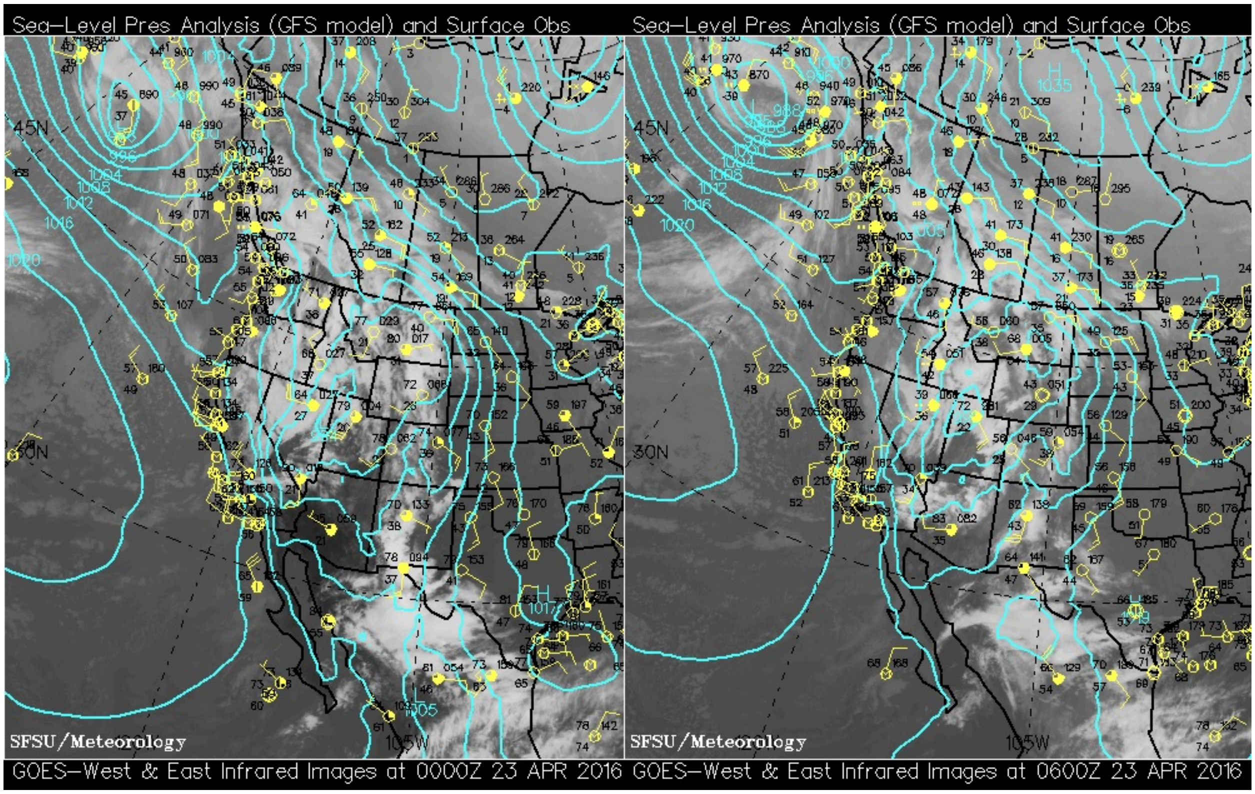


Fig 5-1: A GOES-W infrared sea level pressure analysis image shows the strengthening of the pressure gradient at 1600 PST (left) and 1900 PST (right) on April 22, 2016. Source: SFSU Department of Earth & Climate Sciences and the California Regional weather Server; http://squall.sfsu.edu/crws/archive/sathts_arch.html

FIGURE 5-2
SURFACE ANALYSIS MAP

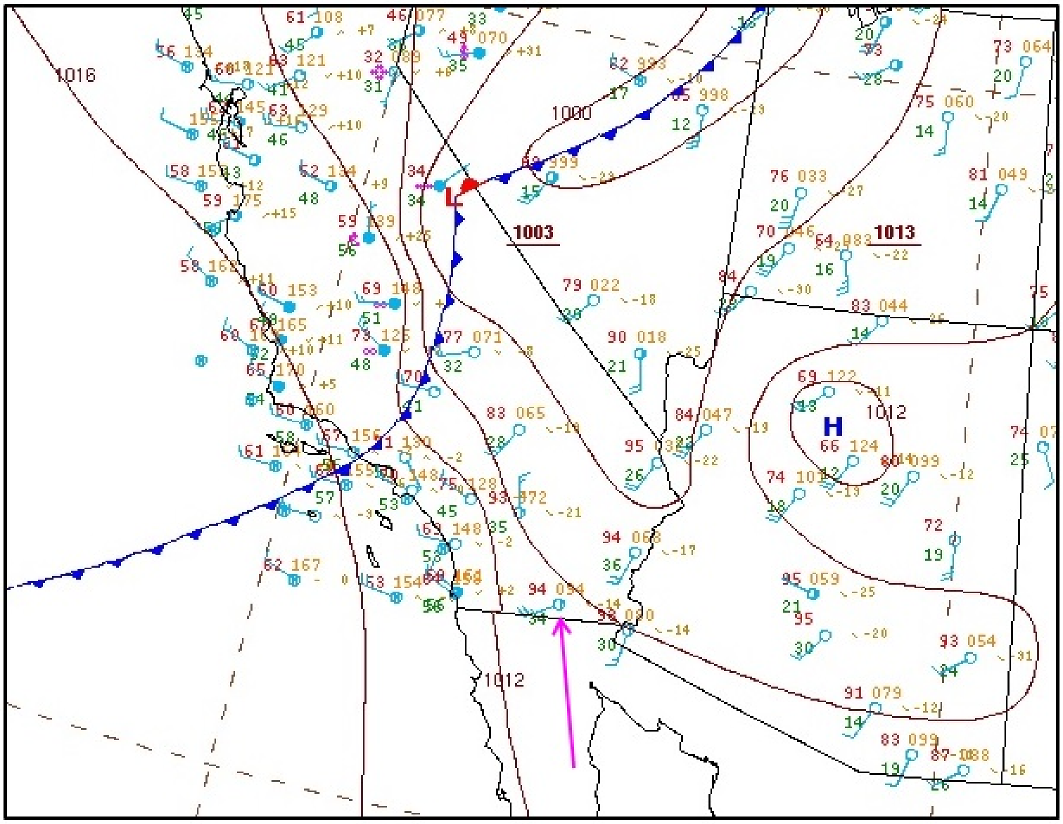


Fig 5-2: A surface analysis map showing a moderate packing of the gradient over southeastern California at 1600 PST. The wind barb at El Centro NAF (KNJK) (see arrow) indicates southwesterly winds of at least 28.3 mph. Winds shifted southwest-to-westerly in the early afternoon and began increasing shortly after. By 1556 PST winds at El Centro NAF were 26 mph with 31 mph gusts. Source: Weather Prediction Center Surface Analysis Archive

Figure 5-3 is a satellite image of the Aerosol Optical Depth[11] over southeastern California as captured by the MODIS instrument onboard the Terra satellite. Darker colors indicate a heavier layer of aerosols.

[11] **Aerosol Optical Depth (AOD)** (or Aerosol Optical Thickness) indicates the level at which particles in the air (aerosols) prevent light from traveling through the atmosphere. Aerosols scatter and absorb incoming sunlight, which reduces visibility. From an observer on the ground, an AOD of less than 0.1 is "clean" - characteristic of clear blue sky, bright sun and maximum visibility. As AOD increases to 0.5, 1.0, and greater than 3.0, aerosols become so dense that sun is obscured. Sources of aerosols include pollution from factories, smoke from fires, dust from dust storms, sea salt, and volcanic ash and smog. Aerosols compromise human health when inhaled by people, particularly those with asthma or other respiratory illnesses. Source: https://worldview.earthdata.nasa.gov

FIGURE 5-3
AEROSOL OPTICAL DEPTH TERRA SATELLITE

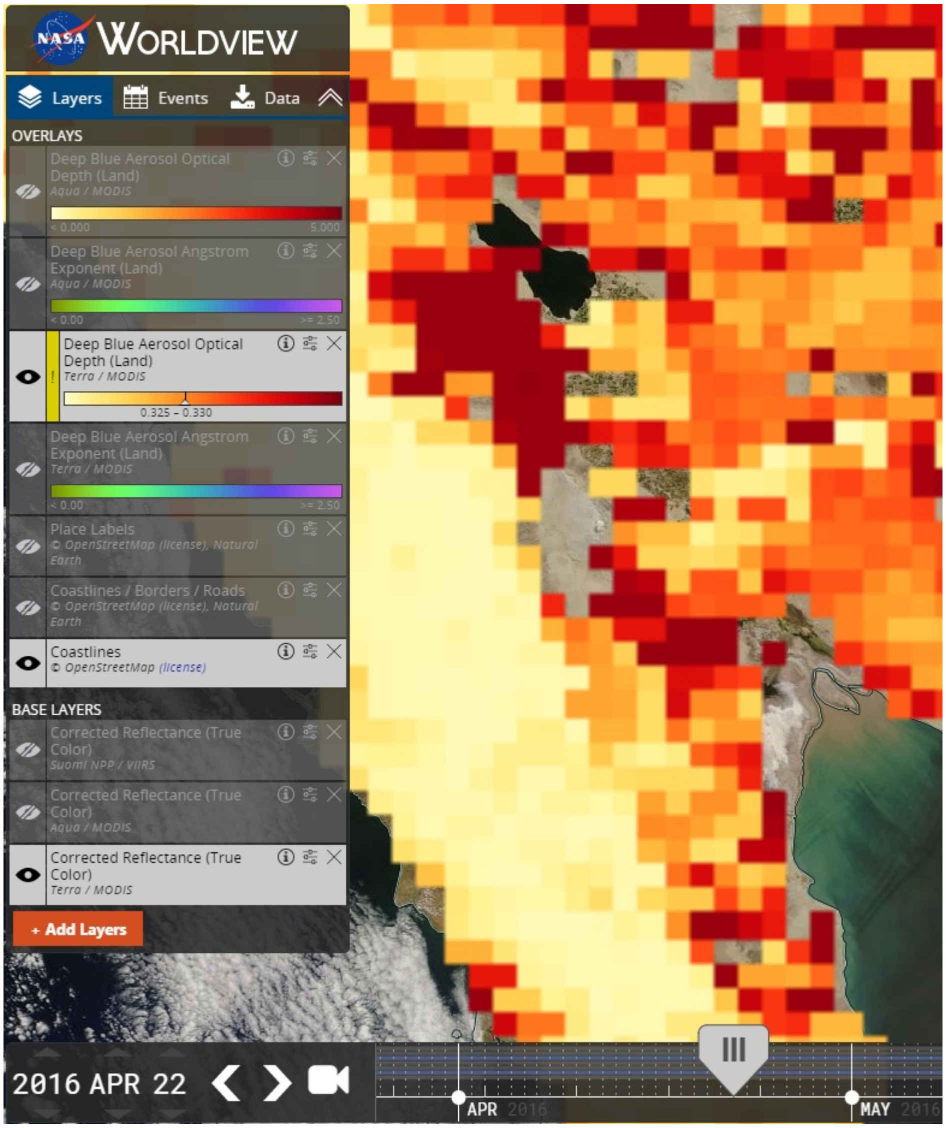


Fig 5-3: Aerosol optical depth as captured by the MODIS instrument onboard the Terra satellite using the Deep Blue Angstrom exponent around ~1030 PST. Source: https://worldview.earthdata.nasa.gov

Figure 5-4 is a satellite image of the AOD as captured by the MODIS instrument onboard the Aqua satellite using the Deep Blue Aerosol Angstrom Exponent.[12] Green colors represent the

[12] The MODIS Deep Blue Aerosol Ångström Exponent layer can be used to provide additional information related to the aerosol particle size over land. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths). The Ångström exponent provides additional information on the particle size (larger the exponent, the smaller the particle size). Values < 1 suggest optical dominance of coarse particles (e.g. dust) and values > 1 suggest optical dominance of fine particles (e.g. smoke) https://worldview.earthdata.nasa.gov The Ångström Exponent (denoted as AE or α) is a measure of how the AOD changes relative to the various wavelength of light (known as 'spectral dependence'.) This is related to the aerosol particle size. Roughly speaking, values less than 1 suggest an optical dominance of coarse particles (e.g.

dominance of larger particles (likely dust) while blue indicates finer particles.

FIGURE 5-4
AEROSOL OPTICAL DEPTH AQUA SATELLITE

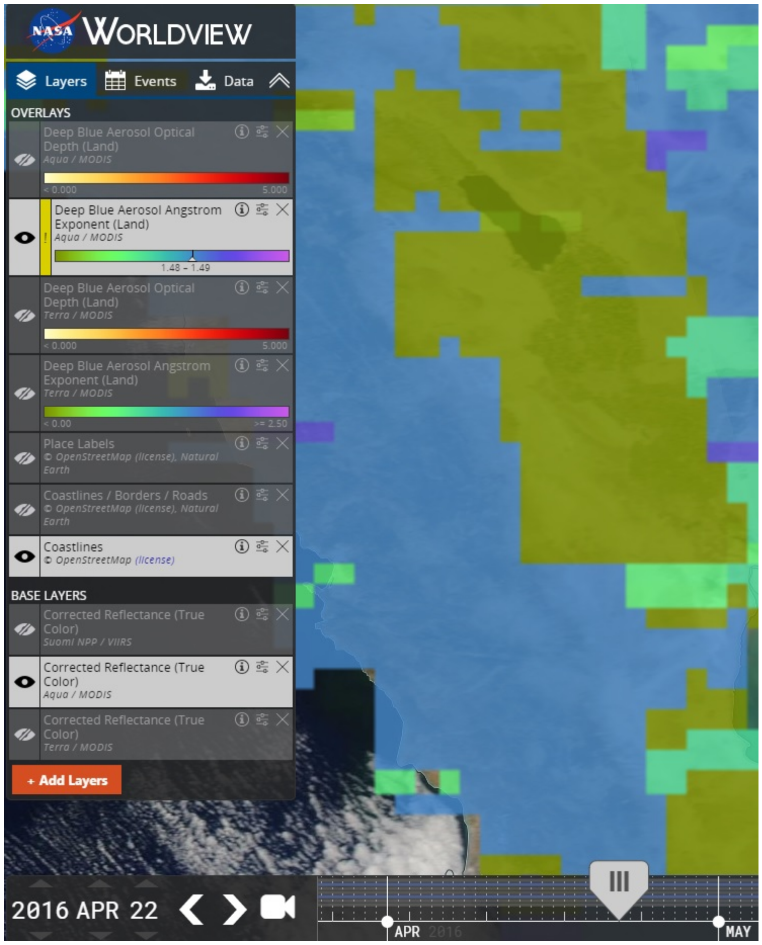


Fig 5-4: Aerosol optical depth as captured by the MODIS instrument onboard the Aqua satellite using the Deep Blue Angstrom exponent around ~1330 PST. Source: https://worldview.earthdata.nasa.gov

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[13] **Tables 5-2 through 5-4** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at the exceeding stations and Niland. Although the Niland monitor did not exceed the NAAQS, the monitor measured elevated concentrations in correlation to the event. Like the Brawley and Westmorland monitors, which showed peak hourly concentrations following or during the period of high upstream wind speeds, the Niland monitor similarly measured elevated concentrations.

dust, ash, sea spray), while values greater than one 1 dominance of fine particles (e.g. smoke, industrial pollution); https://deepblue.gsfc.nasa.gov/science.

[13] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016

TABLE 5-2
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR BRAWLEY APRIL 22, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				SUNRISE-OCOTILLO (IMPSD)				MOUNTAIN SPRINGS GRADE (TSCN1)				BRAWLEY	
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	PM_{10} (µg/m³)
56	5		20	53	6		140	0	7	13	270	0:50	23	34	207	0	32
156	0		0	153	0		0	100	8	14	228	1:50	22	36	209	100	27
256	3		180	253	3		240	200	5	9	256	2:50	22	34	201	200	36
356	8		170	353	7		150	300	7	12	231	3:50	23	35	203	300	37
456	3		200	453	5		240	400	9	15	246	4:50	21	32	201	400	30
556	0		0	553	3		170	500	8	14	228	5:50	23	33	197	500	45
656	6		140	653	5		130	600	4	8	261	6:50	20	28	204	600	71
756	5		130	753	5		130	700	4	6	63	7:50	18	29	195	700	66
856	7		130	853	6		VR	800	5	8	112	8:50	14	22	202	800	57
956	6		VR	953	3		120	900	8	11	95	9:50	11	22	204	900	47
1056	5		VR	1053	6		80	1000	8	13	81	10:50	9	20	190	1000	31
1156	6		VR	1153			M	1100	10	15	106	11:50	15	20	219	1100	21
1256	7		VR	1253	8		110	1200	11	17	162	12:50	16	25	208	1200	24
1356	9		120	1353	10	17	170	1300	17	26	222	13:50	16	24	202	1300	37
1456	9	20	190	1453	9		160	1400	12	22	250	14:50	17	27	203	1400	41
1556	26	31	240	1553	16		250	1500	13	23	253	15:50		32	239	1500	41
1656	24	30	250	1653	18		250	1600	13	23	269	16:50	20	34	211	1600	102
1756	25	34	250	1753	24	31	260	1700	21	34	250	17:50	31	45	205	1700	509
1856	30	36	260	1853	26	33	250	1800	12	28	263	18:50	33	46	207	1800	378
1956	23	32	270	1953	23	31	280	1900	17	30	251	19:50	34	47	207	1900	995
2056	22		260	2053	21	30	260	2000	21	32	254	20:50	37	52	201	2000	995
2156	18		260	2153	17		270	2100	18	39	263	21:50	42	58	206	2100	995
2256	21	30	270	2253	16		270	2200	20	33	252	22:50	39	57	203	2200	519
2356	18		280	2353	20		290	2300	19	32	254	23:50	32	53	207	2300	679

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for Sunrise Ocotillo (IMPSD) and Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Brawley station does not measure wind data. Wind speeds = mph; Direction = degrees

TABLE 5-3
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR WESTMORLAND APRIL 22, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				SUNRISE-OCOTILLO (IMPSD)				WESTMORLAND			WESTMORLAND	
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/D	HOUR	PM_{10} (µg/m³)
56	5		20	53	6		140	0	7	13	270	0	1.5	244	0	27
156	0		0	153	0		0	100	8	14	228	100	2.2	277	100	41
256	3		180	253	3		240	200	5	9	256	200	3.1	236	200	55
356	8		170	353	7		150	300	7	12	231	300	5.3	280	300	37
456	3		200	453	5		240	400	9	15	246	400	1.8	224	400	53
556	0		0	553	3		170	500	8	14	228	500	2	209	500	61
656	6		140	653	5		130	600	4	8	261	600	3.6	176	600	52
756	5		130	753	5		130	700	4	6	63	700	4.8	164	700	69
856	7		130	853	6		VR	800	5	8	112	800	4.8	143	800	83
956	6		VR	953	3		120	900	8	11	95	900	5.6	96	900	
1056	5		VR	1053	6		80	1000	8	13	81	1000	4.2	101	1000	33
1156	6		VR	1153			M	1100	10	15	106	1100	3.8	102	1100	37
1256	7		VR	1253	8		110	1200	11	17	162	1200	5.5	95	1200	30
1356	9		120	1353	10	17	170	1300	17	26	222	1300	5.6	144	1300	29
1456	9	20	190	1453	9		160	1400	12	22	250	1400	6.8	145	1400	32
1556	26	31	240	1553	16		250	1500	13	23	253	1500	7.1	169	1500	85
1656	24	30	250	1653	18		250	1600	13	23	269	1600	8.6	275	1600	355
1756	25	34	250	1753	24	31	260	1700	21	34	250	1700	12	286	1700	713
1856	30	36	260	1853	26	33	250	1800	12	28	263	1800	13	279	1800	917
1956	23	32	270	1953	23	31	280	1900	17	30	251	1900	12	279	1900	403
2056	22		260	2053	21	30	260	2000	21	32	254	2000	15	282	2000	412
2156	18		260	2153	17		270	2100	18	39	263	2100	15	283	2100	422
2256	21	30	270	2253	16		270	2200	20	33	252	2200	15	279	2200	204
2356	18		280	2353	20		290	2300	19	32	254	2300	14	289	2300	270

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Westmorland does not measure gusts. Wind data for Sunrise Ocotillo (IMPSD) from the University of Utah's MesoWest system. Wind and air quality data for Westmorland from the EPA's AQS data bank. Wind speeds = mph; Direction = degrees

TABLE 5-4
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR NILAND APRIL 22, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				SUNRISE-OCOTILLO (IMPSD)				NILAND			NILAND	
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/D	HOUR	PM_{10} ($\mu g/m^3$)
56	5		20	53	6		140	0	7	13	270	0	6.5	136	0	15
156	0		0	153	0		0	100	8	14	228	100	6.7	94	100	17
256	3		180	253	3		240	200	5	9	256	200	6.9	90	200	23
356	8		170	353	7		150	300	7	12	231	300	5.7	82	300	19
456	3		200	453	5		240	400	9	15	246	400	5	88	400	22
556	0		0	553	3		170	500	8	14	228	500	3.3	91	500	64
656	6		140	653	5		130	600	4	8	261	600	6.3	114	600	39
756	5		130	753	5		130	700	4	6	63	700	8	141	700	32
856	7		130	853	6		VR	800	5	8	112	800	9.7	141	800	51
956	6		VR	953	3		120	900	8	11	95	900	9.1	147	900	42
1056	5		VR	1053	6		80	1000	8	13	81	1000	4.1	133	1000	23
1156	6		VR	1153			M	1100	10	15	106	1100	3.8	151	1100	20
1256	7		VR	1253	8		110	1200	11	17	162	1200	6	156	1200	24
1356	9		120	1353	10	17	170	1300	17	26	222	1300	7.3	165	1300	41
1456	9	20	190	1453	9		160	1400	12	22	250	1400	8	190	1400	23
1556	26	31	240	1553	16		250	1500	13	23	253	1500	7.9	176	1500	32
1656	24	30	250	1653	18		250	1600	13	23	269	1600	11	215	1600	101
1756	25	34	250	1753	24	31	260	1700	21	34	250	1700	24	261	1700	820
1856	30	36	260	1853	26	33	250	1800	12	28	263	1800	23	256	1800	995
1956	23	32	270	1953	23	31	280	1900	17	30	251	1900	21	252	1900	500
2056	22		260	2053	21	30	260	2000	21	32	254	2000	22	265	2000	286
2156	18		260	2153	17		270	2100	18	39	263	2100	19	263	2100	180
2256	21	30	270	2253	16		270	2200	20	33	252	2200	16	268	2200	105
2356	18		280	2353	20		290	2300	19	32	254	2300	20	280	2300	170

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Niland does not measure gusts. Wind data for Sunrise Ocotillo (IMPSD) from the University of Utah's MesoWest system. Wind and air quality data for Niland from the EPA's AQS data bank. Wind speeds = mph; Direction = degrees

Figure 5-5 depicts a 12-hour back-trajectory ending at Brawley and Westmorland stations at 1800 PST coincident with the peak concentration measured at the Niland and Westmorland monitors on April 22, 2016 (**Table 5-1**). Through most of the day winds were light and variable. Starting mid-afternoon a burst of winds and strong gusts swept through Imperial County. Topography influenced the high winds along the San Diego Mountains and desert slopes at places like Mountain Springs Grade where entrained windblown dust blew across the desert floor toward the Niland, Brawley and Westmorland monitors. Elevated concentrations, specifically at the Brawley and Westmorland stations were evident as the winds entrained fugitive dust into Imperial County. Within a span of a few hours both monitors rose from moderate PM_{10} levels to 24-hour maximums.

FIGURE 5-5
EXCEEDANCE TIMELINE

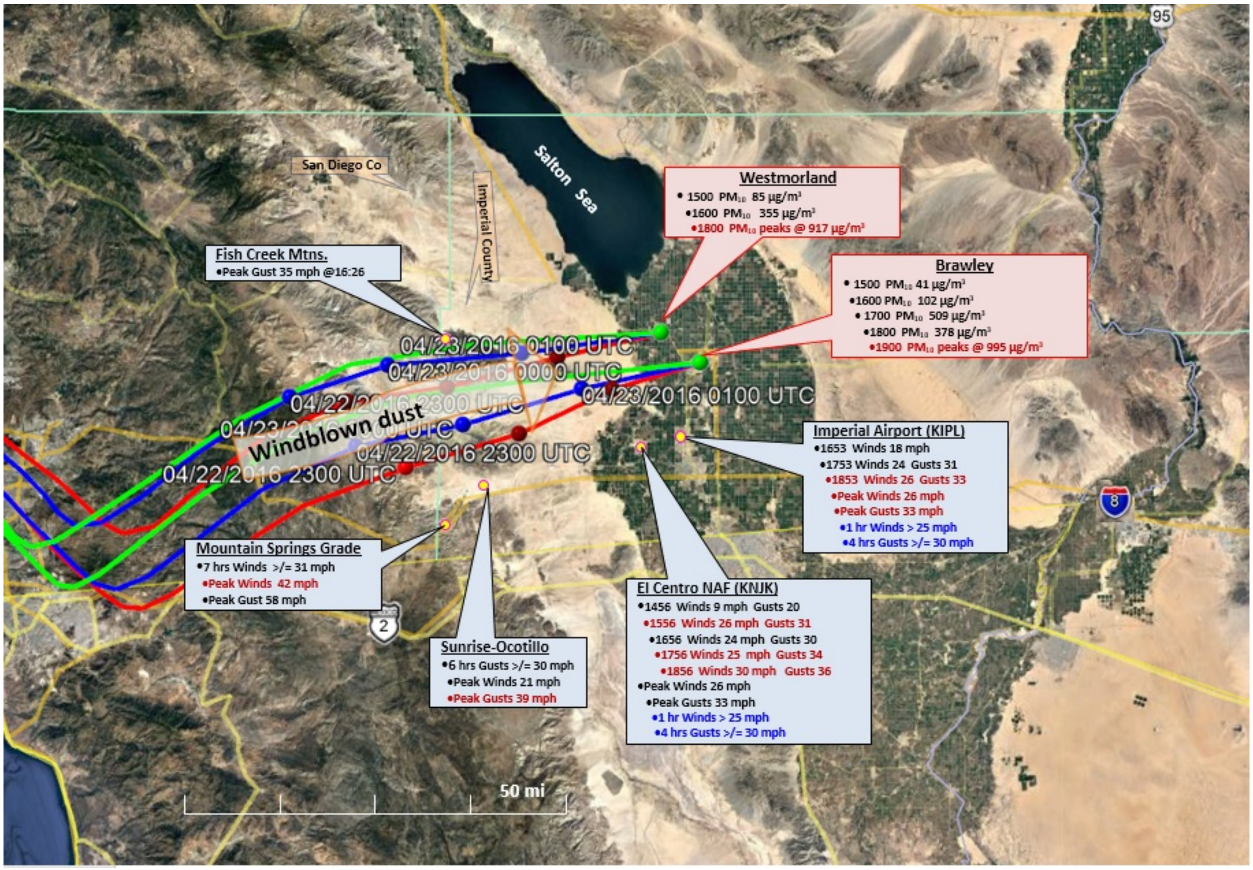


Fig 5-5: The April 22, 2016 wind event was brief but strong. A burst of mid-afternoon winds and gusts swept through Imperial County causing exceedances at the Brawley and Westmorland monitoring stations. Red trajectories indicate airflow at 10m; blue is airflow at 100m; green is 500m. Times are for the red and blue trajectories. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figure 5-6 and 5-7 depict PM_{10} concentrations and wind speeds over a 72-hour period at Brawley and Westmorland. Fluctuations in hourly concentrations at Brawley and Westmorland over 72 hours show a positive correlation with wind speeds, and particularly with gusts, at Imperial County Airport (KIPL) and the El Centro NAF (KNJKL).

FIGURE 5-6
BRAWLEY PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

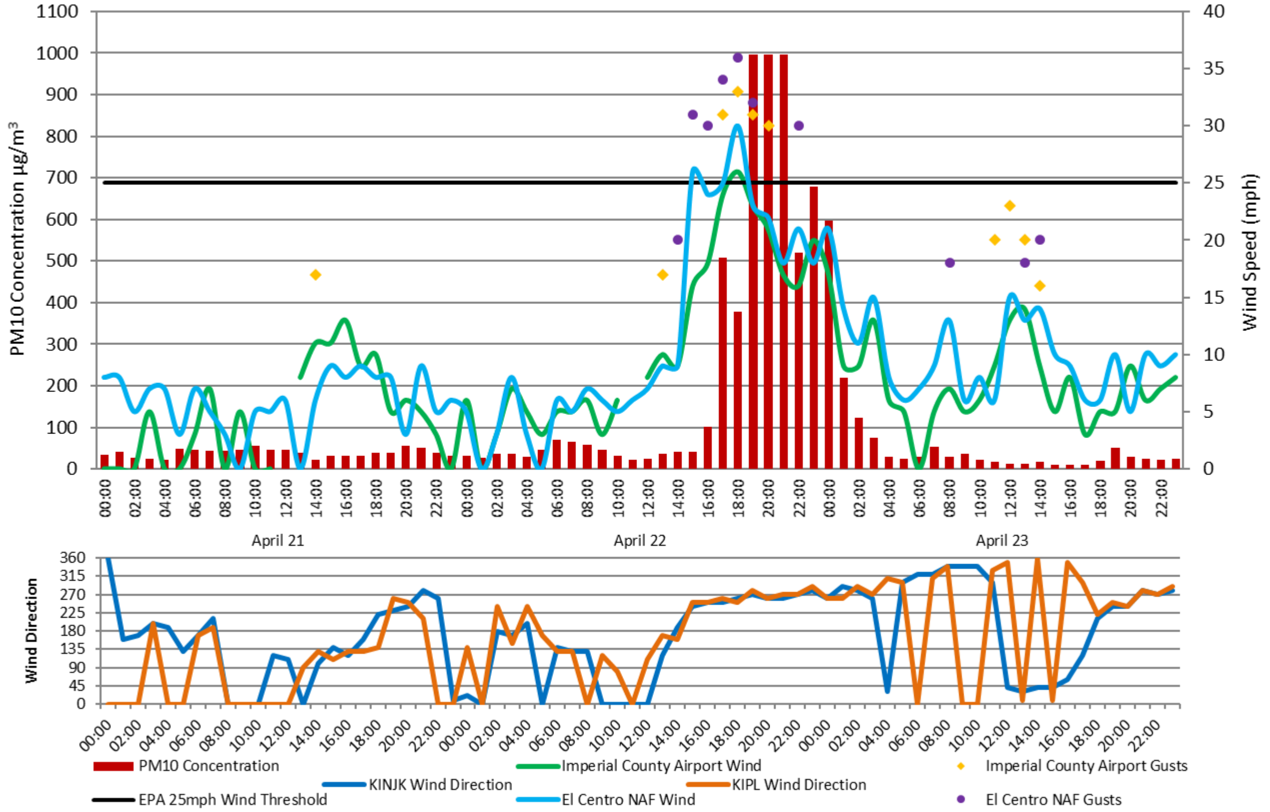


Fig 5-6: Fluctuations in hourly concentrations over 72 hours show a positive correlation with wind speeds, and particularly gusts, at Imperial County Airport (KIPL) and El Centro NAF (KNJKL). Wind speeds increased as the wind shifted more westerly around noon. Brawley station does not measure wind. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

FIGURE 5-7
WESTMORLAND PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

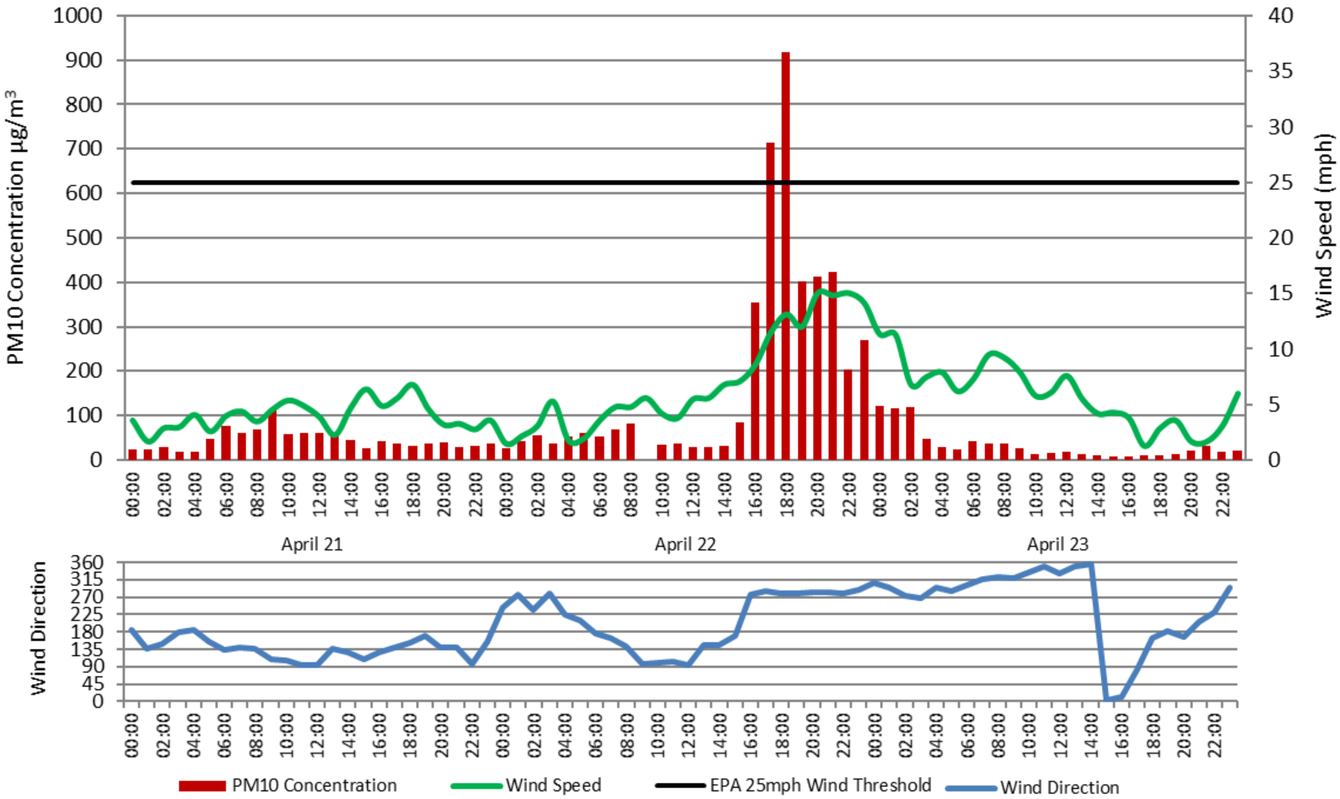


Fig 5-7: Is the graphical representation of the measured winds and concentrations in Westmorland. Meteorological sensors southwest of the monitor measured elevated levels of wind speeds entraining fugitive emissions towards Westmorland. As the windblown dust reaches Westmorland lesser wind speeds allowed for the deposition of the dust onto the monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA’s AQS data bank

Figure 5-8 shows the PM_{10} concentrations at Brawley and Westmorland along with the wind speeds at upstream locations. A burst of winds and gusts during the mid-to-late afternoon caused concentrations at Brawley and Westmorland to rise over a period of a few hours. As winds subsided concentrations similarly reduced.

FIGURE 5-8

WESTMORLAND AND BRAWLEY PM_{10} CONCENTRATIONS AND UPSTREAM WIND SPEEDS

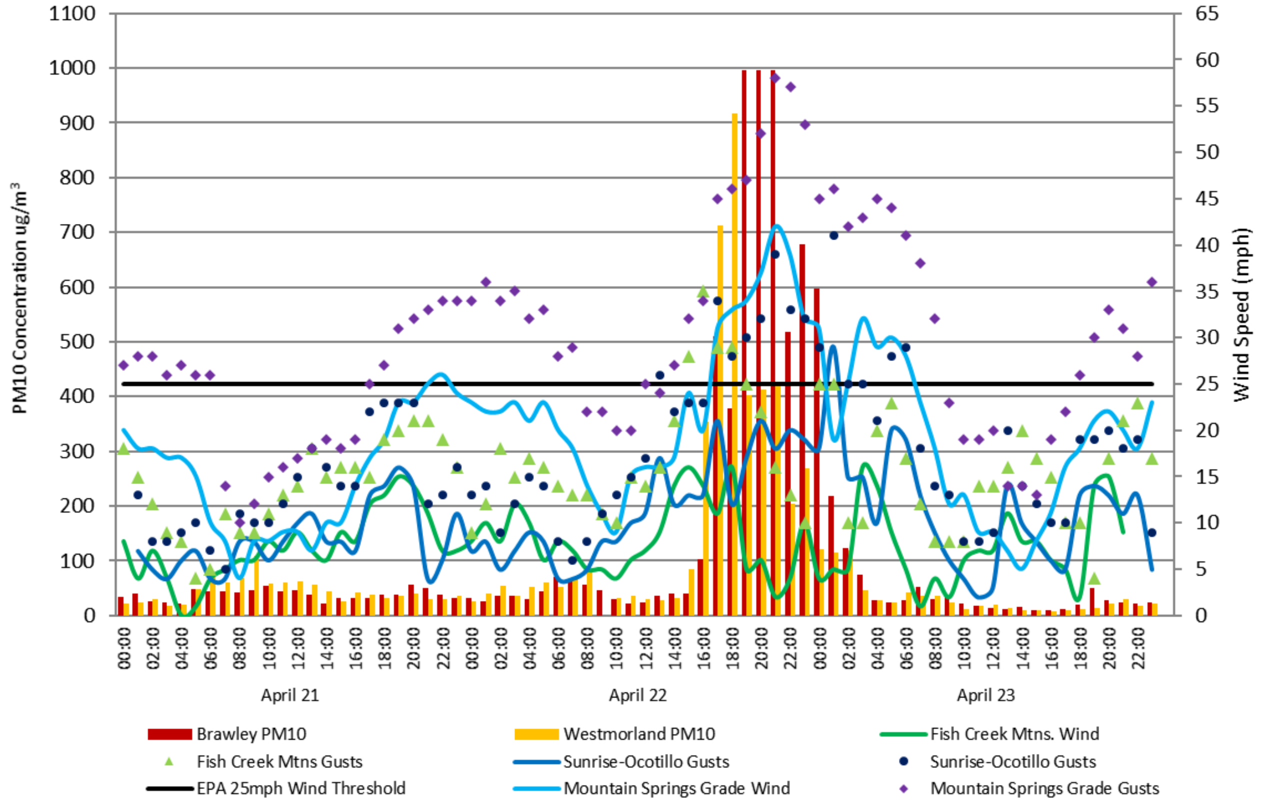


Fig 5-8: An increase in winds and particularly gusts at upstream sites led to an increase in PM_{10} concentrations as fugitive windblown dust made its way downstream. A burst of winds and gusts during the mid-to-late afternoon caused concentrations at Brawley and Westmorland to rise over a period of a few hours. As winds subsided concentrations similarly reduced. Air quality data from the EPA's AQS data bank. Wind data from the University of Utah's MesoWest

Figure 5-9 illustrates PM_{10} concentrations and their association with visibility at the two local airports over a 72 hour period. Visibility at local airports reduced slightly, coincident after peak concentrations at the Westmorland monitor and coincident with elevated concentrations at the Brawley monitor.

FIGURE 5-9
WESTMORLAND AND BRAWLEY PM_{10} CONCENTRATIONS AND VISIBILITY

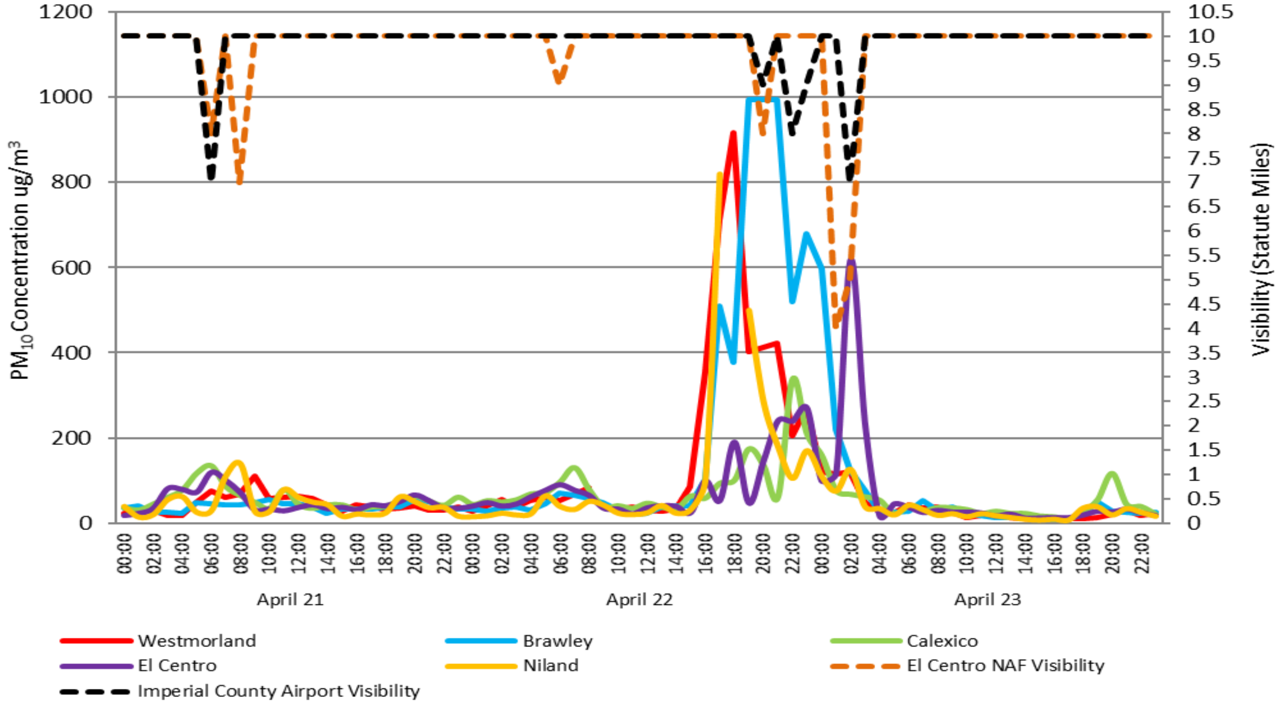


Fig 5-9: An increase in winds and particularly gusts at upstream sites led to an increase in PM_{10} concentrations as windblown dust made its way downstream. A burst of winds and gusts during the mid-to-late afternoon caused concentrations at Brawley and Westmorland to rise over a period of a few hours. As winds subsided concentrations similarly reduced. Air quality data from the EPA's AQS data bank. Visibility data from the NCEI's QCLCD system

The Air Quality Index (AQI)[14] for Westmorland depicted in **Figure 5-10** illustrates the effect caused by the fugitive dust entrained by high winds upon air quality in Imperial County. The effect upon air quality is evident when the rolling 24-hour average AQI for Westmorland remained in the Good or "Green" category. By 6 pm the AQI changes to the Moderate or "Yellow" range (PM_{10} 51-100 µg/m^3). By 10 pm the AQI changes to "Orange" or Unhealthy for Sensitive Groups level (PM_{10} 101-150 µg/m^3) triggering an Air Quality Alert for Westmorland. The alert notified the public that air quality in the area was Unhealthy for Sensitive Groups. By 1:00am on April 23, 2016 the AQI changed to "Unhealthy for Sensitive Groups" in Brawley. Again the notice advised the public that air quality in the area had entered was Unhealthy for Sensitive Groups.

[14] The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health affects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health .Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country Source: https://airnow.gov/index.cfm?action=aqibasics.aqi

FIGURE 5-10
AIR QUALITY INDEX FOR WESTMORLAND APRIL 22, 2016

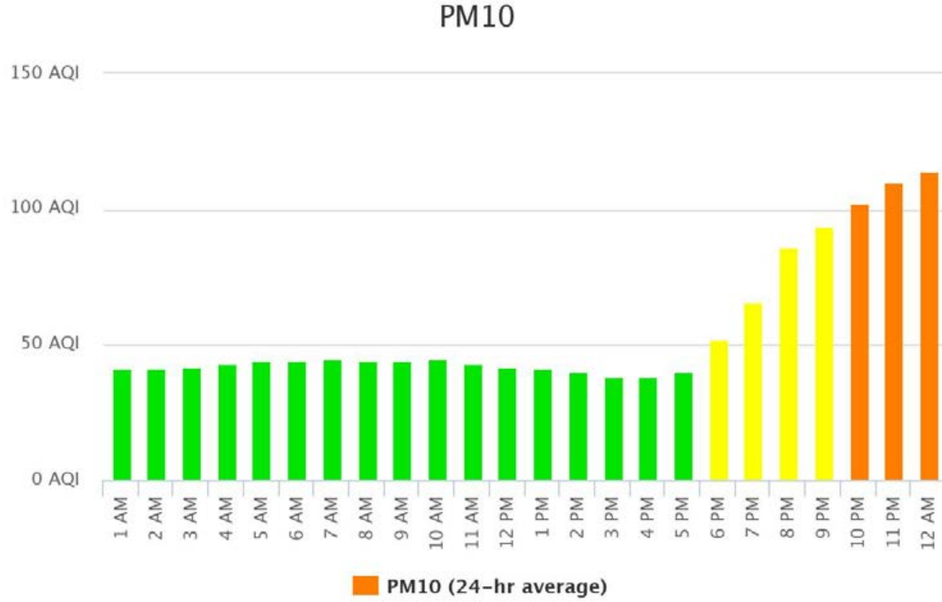


Fig 5-10: The reduced air quality in Westmorland illustrates the effect of fugitive dust entrained by high winds and the subsequent affect to air quality in Imperial County. Source: ICAPCD archives

V.2 Summary

The preceding discussion, graphs, figures and tables provide wind direction, wind speed and PM_{10} concentration data illustrating the spatial and temporal representation of the gusty west winds that were associated with the passage a low-pressure system and associated cold front that passed through the region. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Brawley and Westmorland monitors on April 22, 2016. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the mountains and desert slopes of San Diego County, all of Imperial County and the southern portion of Riverside County. Large amounts of entrained PM_{10} by strong westerly winds entered the lower atmosphere causing a change in the air quality conditions within Imperial County. The entrained dust originated from as far as the mountains and desert slope areas located within San Diego County and Imperial County (part of the Sonoran Desert). Combined, the information demonstrates that the elevated PM_{10} concentrations measured on April 22, 2016 coincided with high wind speeds and that continuous gusty west winds over the southern portion of Riverside County, southeastern San Diego County, all of Imperial County, and parts of Arizona occurred.

FIGURE 5-11
APRIL 22, 2016 WIND EVENT TAKE AWAY POINTS

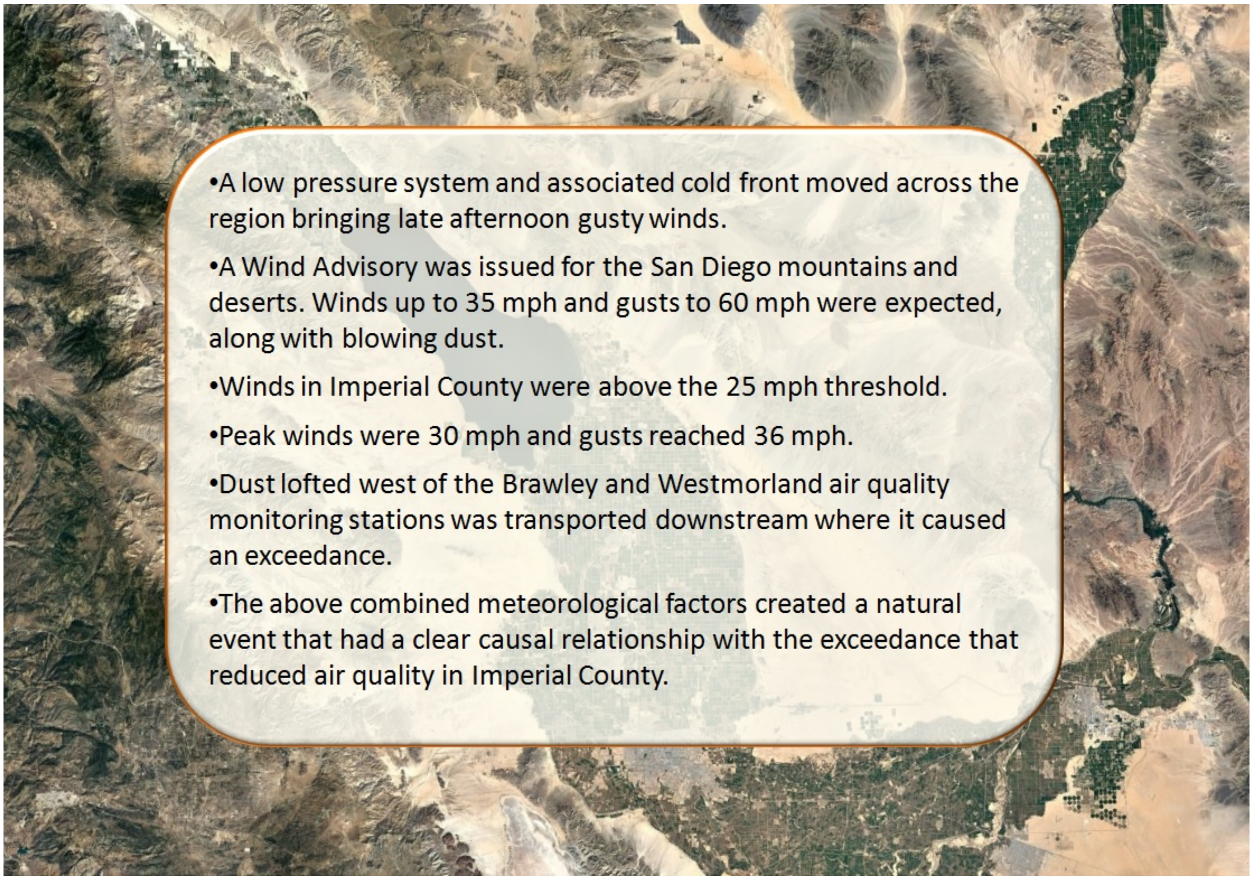


Fig 5-11: Illustrates the factors that qualify the April 22, 2016 as a natural event, which affected air quality and is therefore a demonstrable Exceptional Event

VI Conclusions

The PM_{10} exceedance that occurred on April 22, 2016, satisfies the criteria of the EER, which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1 TECHNICAL ELEMENTS CHECKLIST EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM_{10})		DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	6-29
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	44-56, 58
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	30-36, 58
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	37-43, 57
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	6-29; 37-43, 58

VI.1 Affects Air Quality

The preamble to the revised EER states that an event has affected air quality if the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the April 22, 2016 event, which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

Section 50.1(j) of 40 CFR Part 50 defines an exceptional event as an event that must be "not reasonably controllable or preventable" (nRCP). The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. A natural wind event, which transports dust from natural open deserts, meets the nRCP, when sources are controlled by BACM and when human activity plays little to no direct causal role. This demonstration provides evidence that despite BACM in place within Imperial County, strong

gusty west winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM_{10} exceedance measured at the Brawley and Westmorland monitors caused by naturally occurring strong gusty westerly winds transported windblown dust into Imperial County and other parts of southern California from areas located within the San Diego Mountains. These facts provide strong evidence that the PM_{10} exceedance at the Brawley and Westmorland monitors on April 22, 2016, were not reasonably controllable or preventable.
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VI.3 Natural Event

The revised preamble to the EER clarifies that a "Natural Event" (50.1(k) of 40 CFR Part 50) is an event and its resulting emissions, which may recur at the same location where anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions, thus meeting the criteria that human activity played little or no direct causal role. As discussed within this demonstration, the PM_{10} exceedances that occurred at Brawley and Westmorland on April 22, 2016, were caused by the transport of fugitive dust into Imperial County by strong westerly winds associated with the passage of low pressure system and accompanying dry cold that moved through the region. At the time of the event anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at Brawley, Westmorland, and Niland during different days, and the comparative analysis of different areas in Imperial and Riverside county monitors demonstrates a consistency of elevated gusty west winds and concentrations of PM_{10} at the Brawley and Westmorland monitoring stations on April 22, 2016 (Section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty west winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty west winds. Days immediately before and after the high wind event PM_{10} concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedances on April 22, 2016.

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM_{10} values measured at the Brawley and Westmorland monitors were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

This section contains wind advisories issued by the National Weather Service and Imperial County on or around April 22, 2016. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Imperial County.

Appendix B: Meteorological Data.

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside Counties. These plots, graphs and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM_{10} Concentrations and Winds.

This Appendix contains the graphs depicting the correlations between PM_{10} Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside Counties. These graphs demonstrate the region wide impact of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule.

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.